

Section 9 East Kapālama Geographic Zone (T-054 through T-085)

9.1 Overall Location

For reporting purposes for this AIS, the City Center Section 4 of the HHCTCP has been divided into 11 zones based on geographical and cultural boundaries. The East Kapālama Geographic Zone runs along Dillingham Boulevard from Waiakamilo Road at the west end to just east of Akepo Lane at the east end. The eastern boundary also represents the approximate northwestern corner of the historic Kūwili Fishpond/historic shoreline (see Vol. II Figure 8, Vol. II Figure 12, and Vol. II Figure 26). The western third of the East Kapālama Zone corridor is located within Kapālama Ahupua'a, while the eastern two-thirds of the corridor are located within Honolulu Ahupua'a. The *ahupua'a* boundary is on the east side of the Kapālama Canal.

The East Kapālama Zone includes 32 AIS test excavations numbered T-054 through T-085 (Note: T-055 was abandoned because it was located on an existing storm drain box; however, documentation of non-HHCTCP excavations in the immediate vicinity of T-055 were completed to collect appropriate information from this area) (see Vol. IVB Section 2). Test excavation numbering runs from northwest to southeast. The test excavations were located within TMKs [1] 1-5-006, -015, -017, -020, -022 and [1] 1-5-007 (Dillingham Boulevard; owned by the City and County of Honolulu), [1] 1-5-015:008 (section of the *makai* portion of Kapālama Station; owned by DTC Investments, LLC), [1] 1-5-020:003 (section of the *makai* portion of Kapālama Station; owned by Kamehameha Schools), and [1] 1-5-017:006 (*mauka* portion of Kapālama Station; owned by the University of Hawai'i).

9.2 Geography, Geology, and Land Forms

The East Kapālama Zone is situated along the low-lying coastal flats immediately inland of Kapālama Basin, approximately 1 km from the shoreline. Elevations within the East Kapālama Zone range from approximately 1.3 to 2.1 m amsl, with either end near the 2.1 m mark and the internal area at the lower end of the range. At either end of the zone, the Pleistocene limestone shelf is exposed above the modern land surface, which dips down slightly and is level for the majority of the length of the East Kapālama Zone between the limestone shelf exposures. Prior to modern times, this dip would have been more substantial as intensive land reclamation activities in the early to mid-twentieth century raised the land surface. As the East Kapālama Zone traverses a predominantly urban landscape, vegetation in the immediate vicinity is largely the result of landscaping and consists primarily of introduced (non-indigenous) landscaping trees, shrubs, and ground cover. Of particular note, are the numerous *kamani* trees that line much of Dillingham Boulevard. Kapālama Canal (known as Niuhelewai Stream in Traditional times) runs across the East Kapālama Zone along the Kapālama/Honolulu Ahupua'a boundary. The average annual rainfall in the East Kapālama Zone is approximately 760 to 810 mm (30 to 32 inches) (Giambelluca et al. 2011).

According to the U.S. Department of Agriculture Soil Survey Geographic (SSURGO) Database (2001) and soil survey data gathered by Foote et al. (1972), soils within the East

Kapālama Zone consist predominantly of Fill land (FL), with a small area of Ewa silty clay loam (EmA) southwest of T-081 (Figure 133). Fill land soils are described as:

...areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources... This land type is used for urban development including airports, housing areas, and industrial facilities [Foote et al. 1972:31].

Ewa silty clay loam soils are described as:

...well-drained soils in basins and on alluvial fans... [that] developed in alluvium derived from basic igneous rock... These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of fingergrass, kiawe, koa haole, klu, and uhaloa [Foote et al. 1972:29].

9.3 Modern Land Use and Built Environment

The East Kapālama Zone traverses an urban environment through the neighborhoods of Kapālama and Iwilei. The centerline of the project alignment within the East Kapālama Zone lies within Dillingham Boulevard. Parcels bordering Dillingham Boulevard contain largely commercial structures, with some industrial warehouses, and parking lots, with several roads, alleyways, and driveways extending out from Dillingham Boulevard. Dillingham Boulevard itself has been lined with cut basalt curbstones. A massive utility corridor was also present throughout the East Kapālama Zone containing electrical, gas, water, sewer, and storm lines. The number and distribution of these existing utilities indicate that this East Kapālama portion of Dillingham has been heavily disturbed in the past.

9.4 GPR Sediment Summary

Test excavations in the East Kapalama Geographic Zone (Zone 4) revealed that the area was predominantly Fill land (FL) as predicted by the U.S.G.S Soil survey map of the zone (Figure 133). Naturally deposited sediments encountered in this zone were generally too deep for the GPR to clearly read. The average depth of clean signal return for this area was approximately one meter. The only naturally deposited sediment observed in Zone 4 within the range of clean signal return was the coral shelf located in T-084. Representative signal texture profiles for Zone 4 are shown in Figure 134 and Figure 135. Examples of GPR signal textures representing Zone 4 Sediments (T-067 to T-084). Signal texture profiles were only collected if the signal return was clear and the stratum was at least 0.25 m thick.

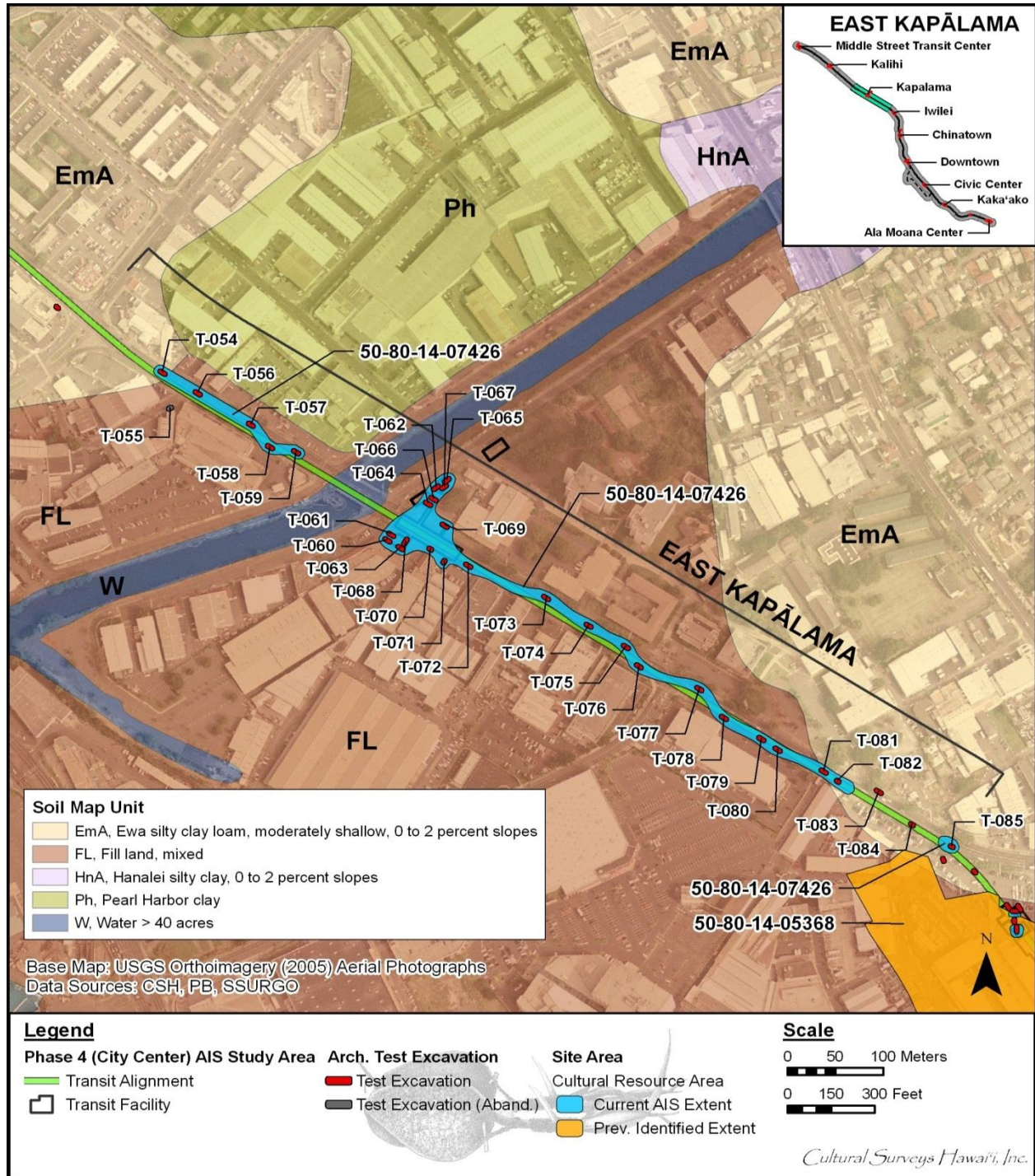
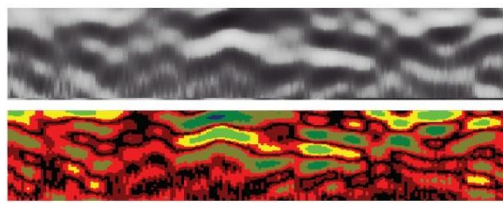
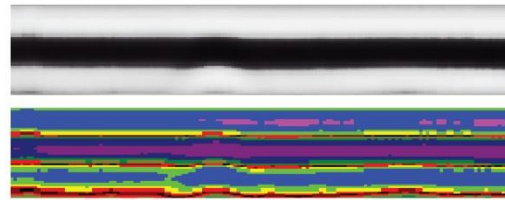


Figure 133. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005) with overlay of the Soil Survey of Hawai'i (Foote et al. 1972) showing sediment types within and in the vicinity of the East Kapālama Zone

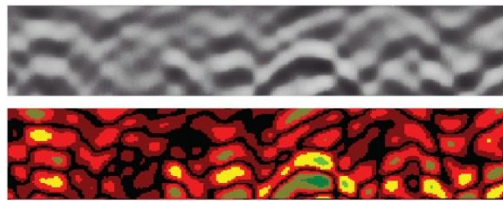
Examples of GPR Signal Textures Representing Zone 4 Sediments



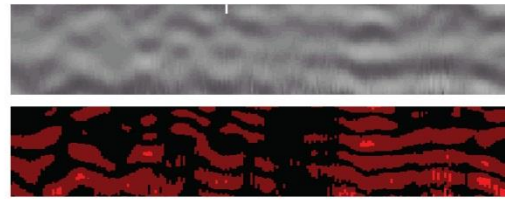
Extremely Gravelly Clay Loam (T-054)



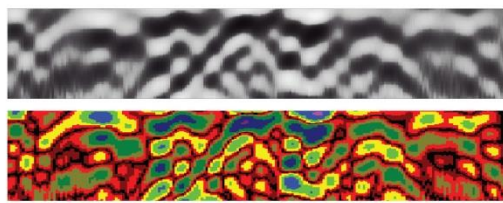
Asphalt (T-061)



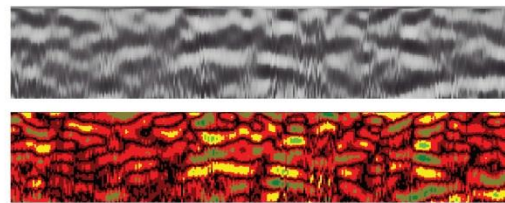
CLSM (T-056)



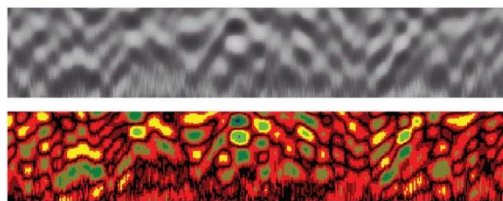
Extremely Gravelly Sandy Clay (T-061)



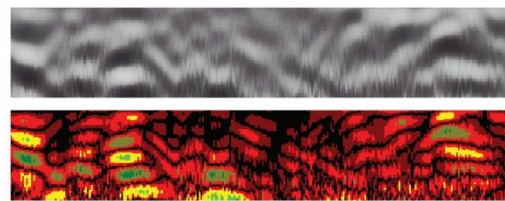
Extremely Gravelly Sand (T-058)



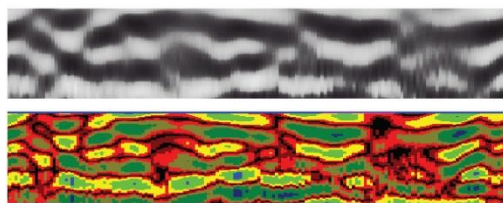
Basalt Gravel (T-062)



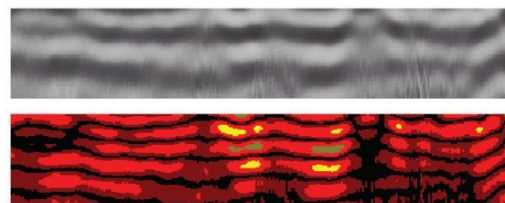
Very Stony Silty Clay (T-057)



Silty Sand (T-064)



Extremely Cobbly Loamy Sand (T-059)



Very Sandy Silt (T-065)

Figure 134. Examples of GPR signal textures representing Zone 4 sediments (T-054 to T-065)

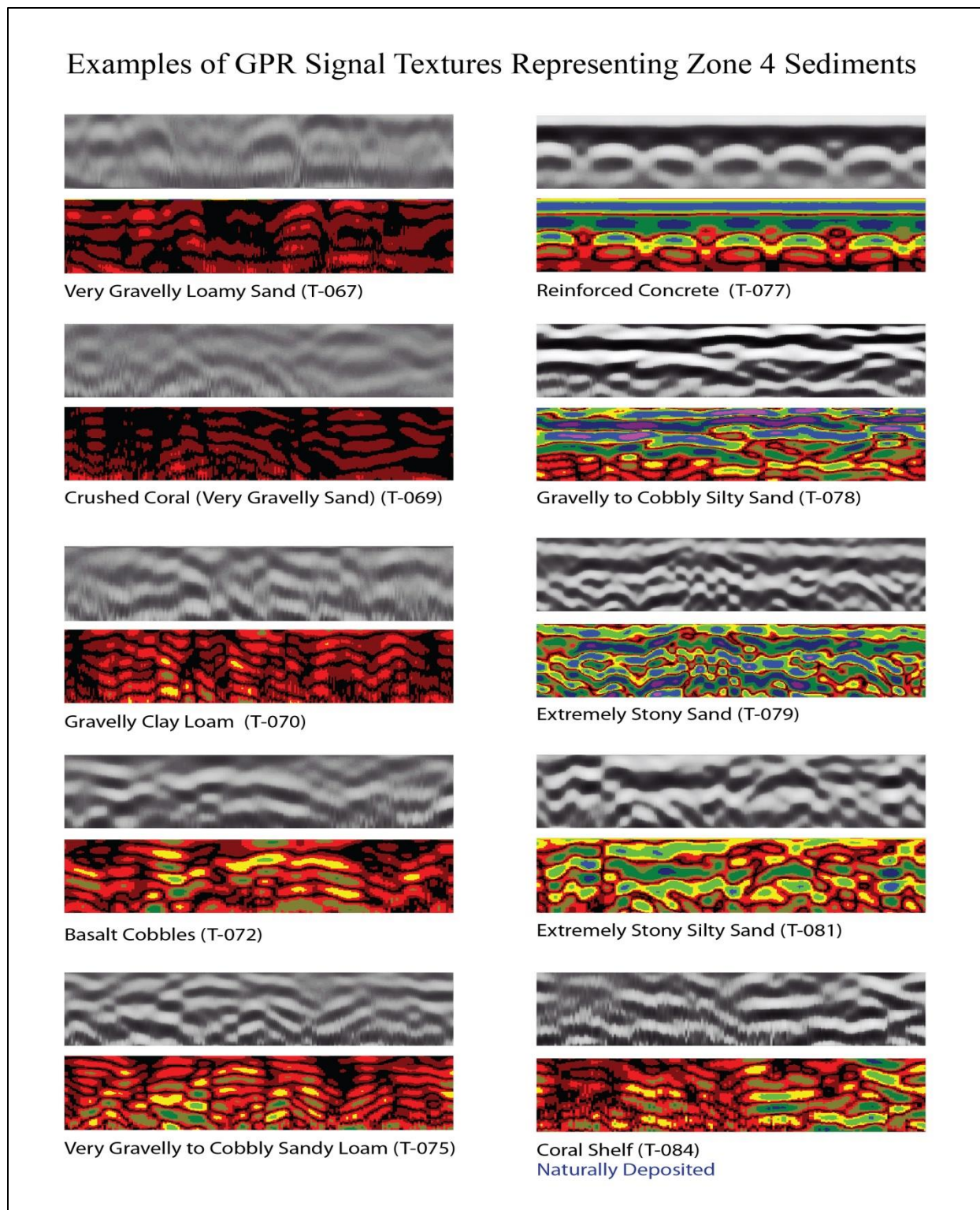


Figure 135. Examples of GPR signal textures representing Zone 4 Sediments (T-067 to T-084)

Test Excavation 54

T-054 measured 1.0 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane, 30.0 m northwest of Dillingham Boulevard and Colburn Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer 2.7 m southwest and a water line 4.3 m northeast. A concrete slab was encountered 0.25 mbs in the southeast end of the excavation.

A review of amplitude slice maps indicated no linear feature although a concrete slab was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 136).

GPR depth profiles for T-054 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 137). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. An anomaly was observed in the profile and corresponded to the concrete slab that was encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

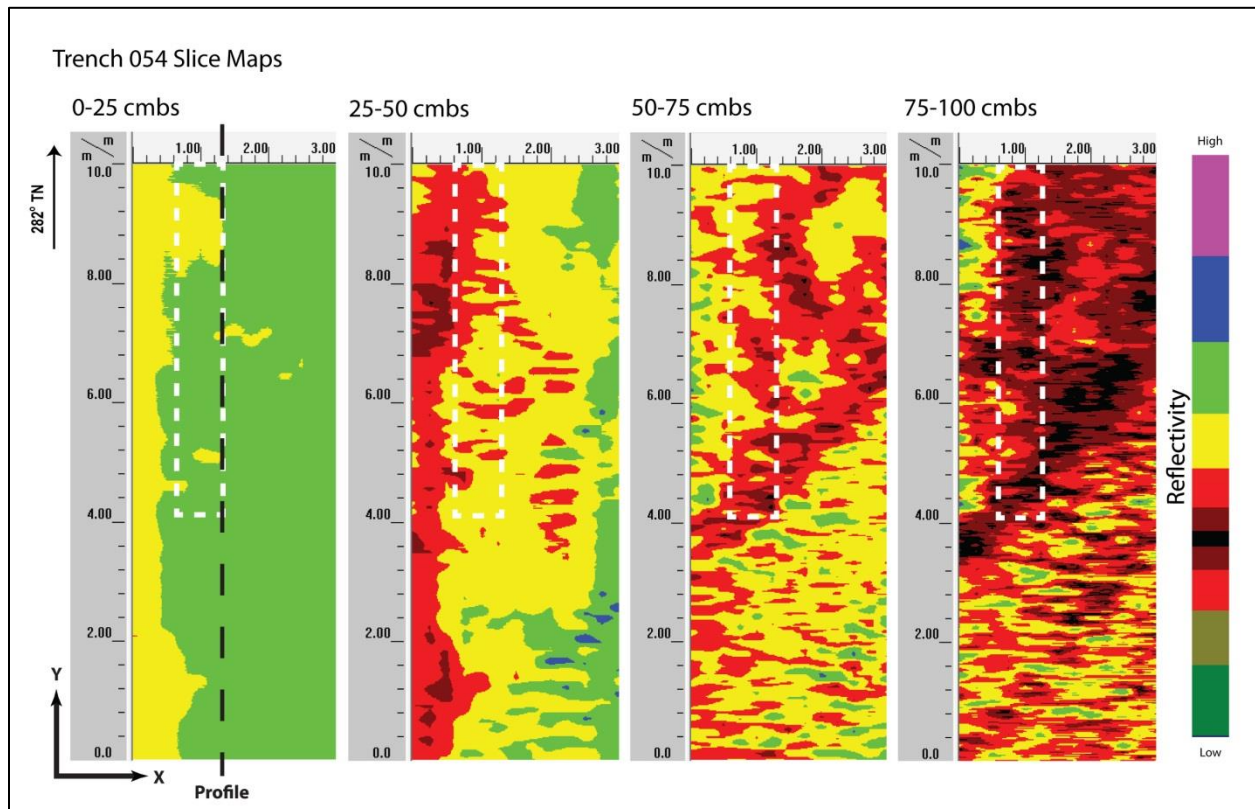


Figure 136. Slice maps of T-054 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 137). Strata Ia was clearly observed and occurs at the ground-truthed depth. An increase in reflectivity was observed around 0.25 mbs and corresponded to stratum Ic's concrete slab which was encountered. Strata included a layer of asphalt on top an extremely cobbly loam followed by gravelly clay loam fill, then an extremely gravelly clay loam fill, then a stony clay loam fill and then a natural clay. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

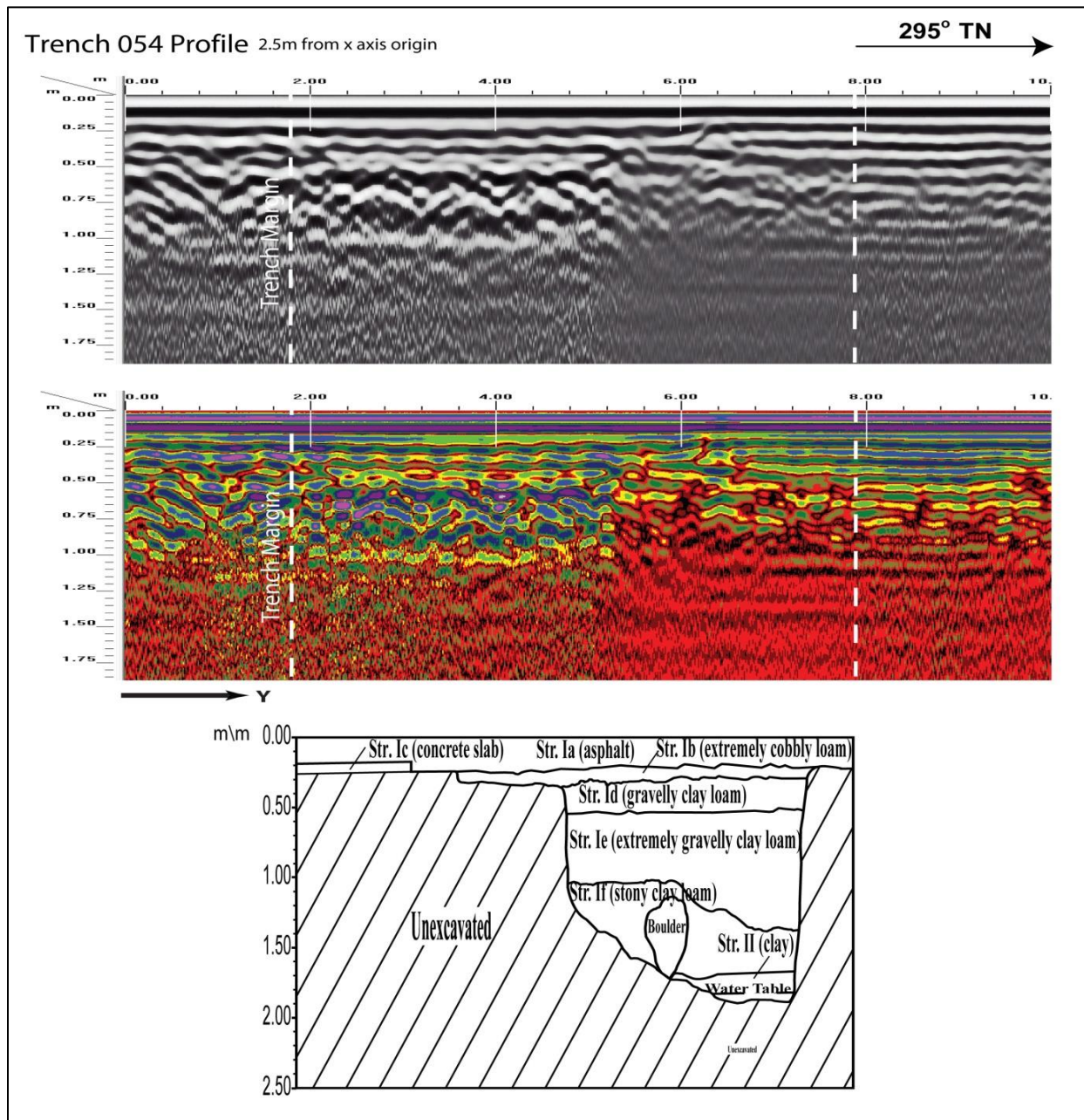


Figure 137. Visual comparison of excavated profile and GPR signal profile of T-054

Test Excavation 56

T-056 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard, 20.0 m northeast of Dillingham Boulevard and Colburn Street intersection. The GPR grid measured 2.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: Water line 2.8 m northwest and 3.7 m northeast, and a sewer line 3.0 m south. A concrete slab was encountered 1.4 mbs in the center and within the northern side of the excavation.

A review of amplitude slice maps indicated a linear feature that was not encountered but a concrete slab that was not observed on the slice maps was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 138).

GPR depth profiles for T-056 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 139). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. An anomaly was observed in the profile that was not encountered but a concrete slab that was not observed on the profile was encountered during excavation. The maximum depth of clean signal return was approximately 1.1 mbs.

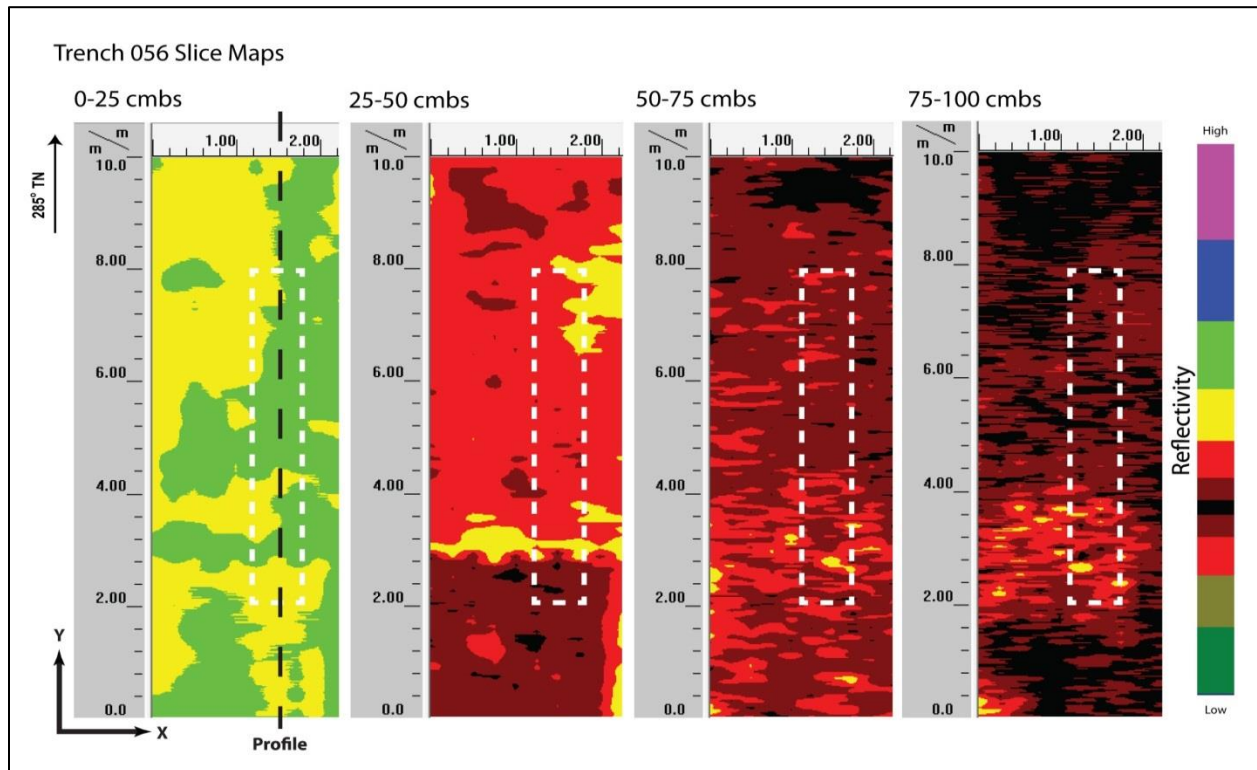


Figure 138. Slice maps of T-056 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 139). Strata included a layer of asphalt on top of several layers of extremely gravelly sand fill, then very gravelly to cobbly sandy clay loam fill and then extremely gravelly silty loam fill. Stratum Ia was the only layer that was clearly depicted and occurred at the ground-truth depth. The other transitions were not clearly depicted in the GPR profile at the depths that they occurred although textural changes were apparent and correspond to the very gravelly to cobbly layers that were observed. A concrete slab was found 1.4 mbs. It was not observed due to the fact that it was below the maximum clean signal return depth. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

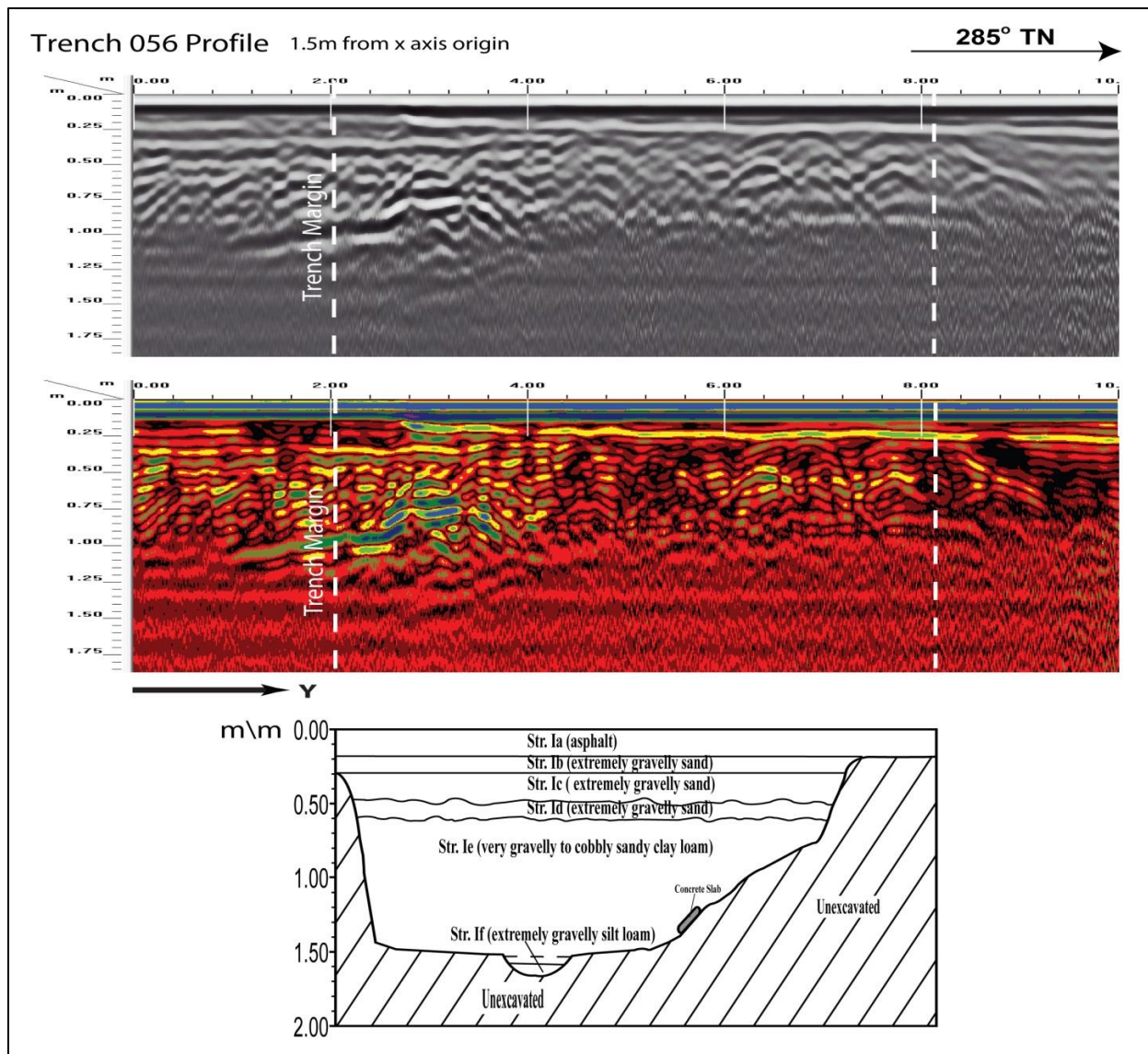


Figure 139. Visual comparison of excavated profile and GPR signal profile of T-056

Test Excavation 57

T-057 measured 0.6 m by 6.0 m and was oriented west to east and was located within the road cut of Dillingham Boulevard, 80.0 m southeast of Dillingham Boulevard and Colburn Street intersection, fronting Zippy's. The GPR grid measured 2.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer line 3.0 m southwest, water line 4.0 m northeast, and an electrical cable 5.0 m southeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 140).

GPR depth profiles for T-057 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 141). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

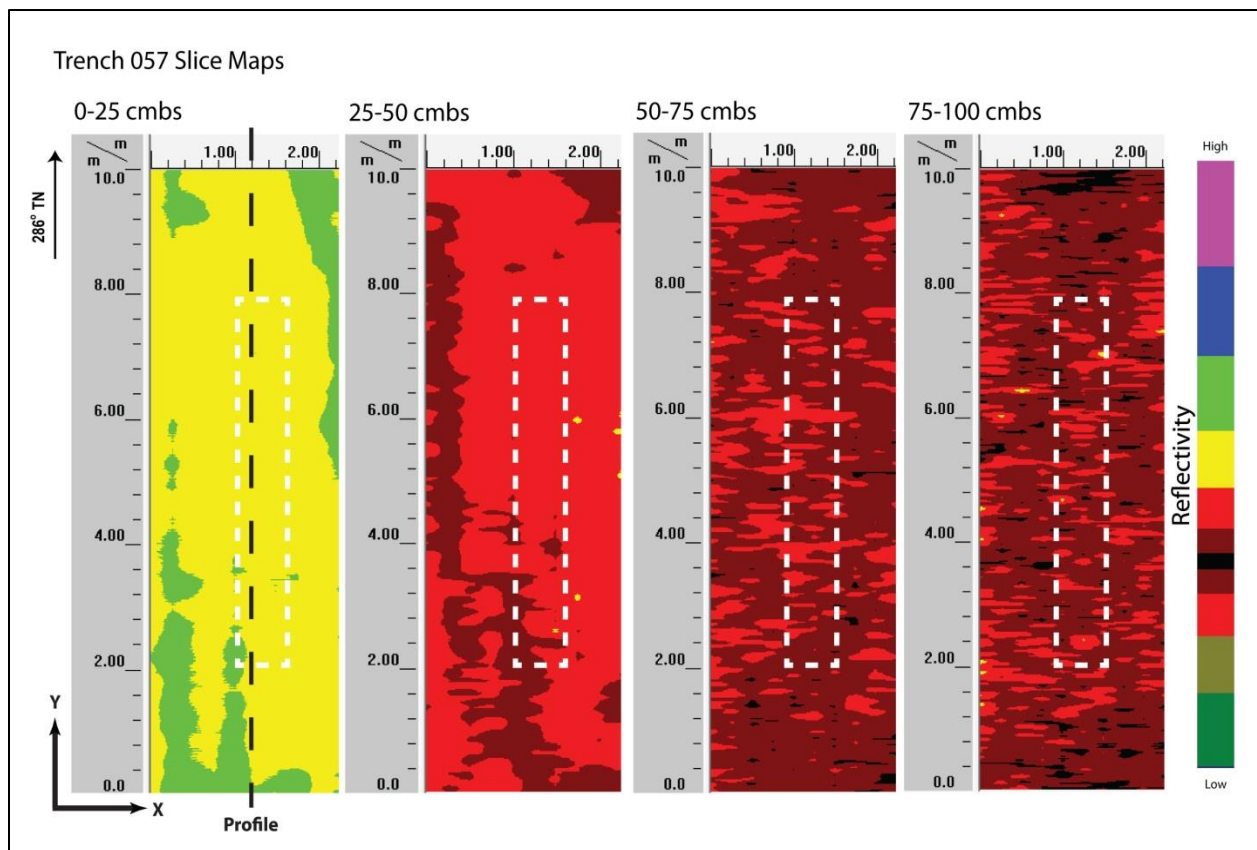


Figure 140. Slice maps of T-057 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 141). Strata Ia through Ie were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ie which was very stony silty clay. All other sediment transitions were below the maximum clean signal return depth. No discrete objects were observed in the GPR results or subsequent excavation.

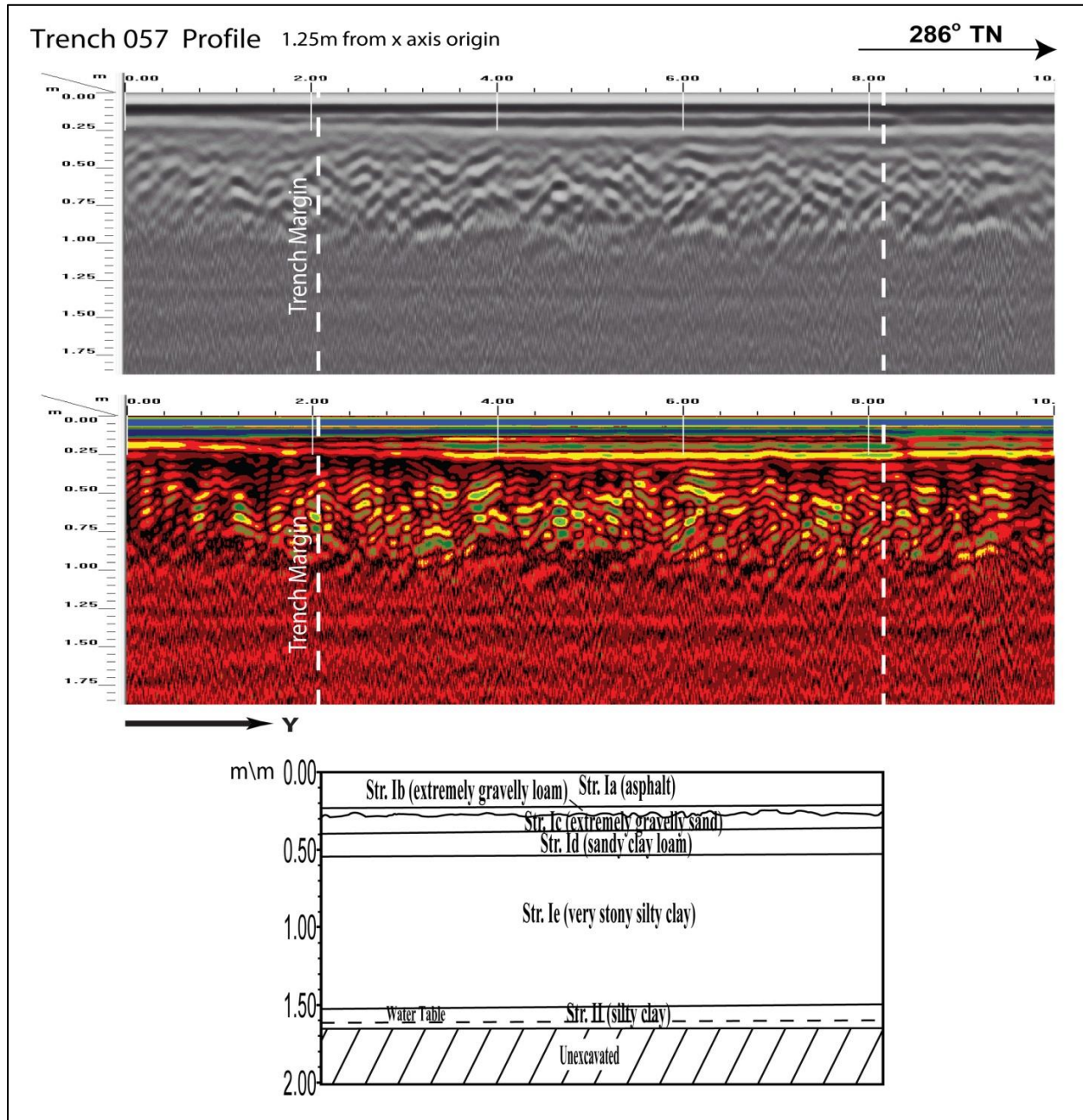


Figure 141. Visual comparison of excavated profile and GPR signal profile of T-57

Test Excavation 58

T-058 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the eastbound center lane, 70.0 m northwest of Dillingham Boulevard and Kohou Street. The GPR grid measured 3.0 m by 8.5 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water drain 2.3 m southwest and a water line 2.3 m northeast. A utility pipe was encountered 0.8 mbs in northwestern end of excavation.

A review of amplitude slice maps indicated a linear feature which corresponded to the utility encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the utility. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 142).

GPR depth profiles for T-058 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 143). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs and again around 0.6 mbs. An anomaly was observed in the profile and corresponded to the utility that was encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

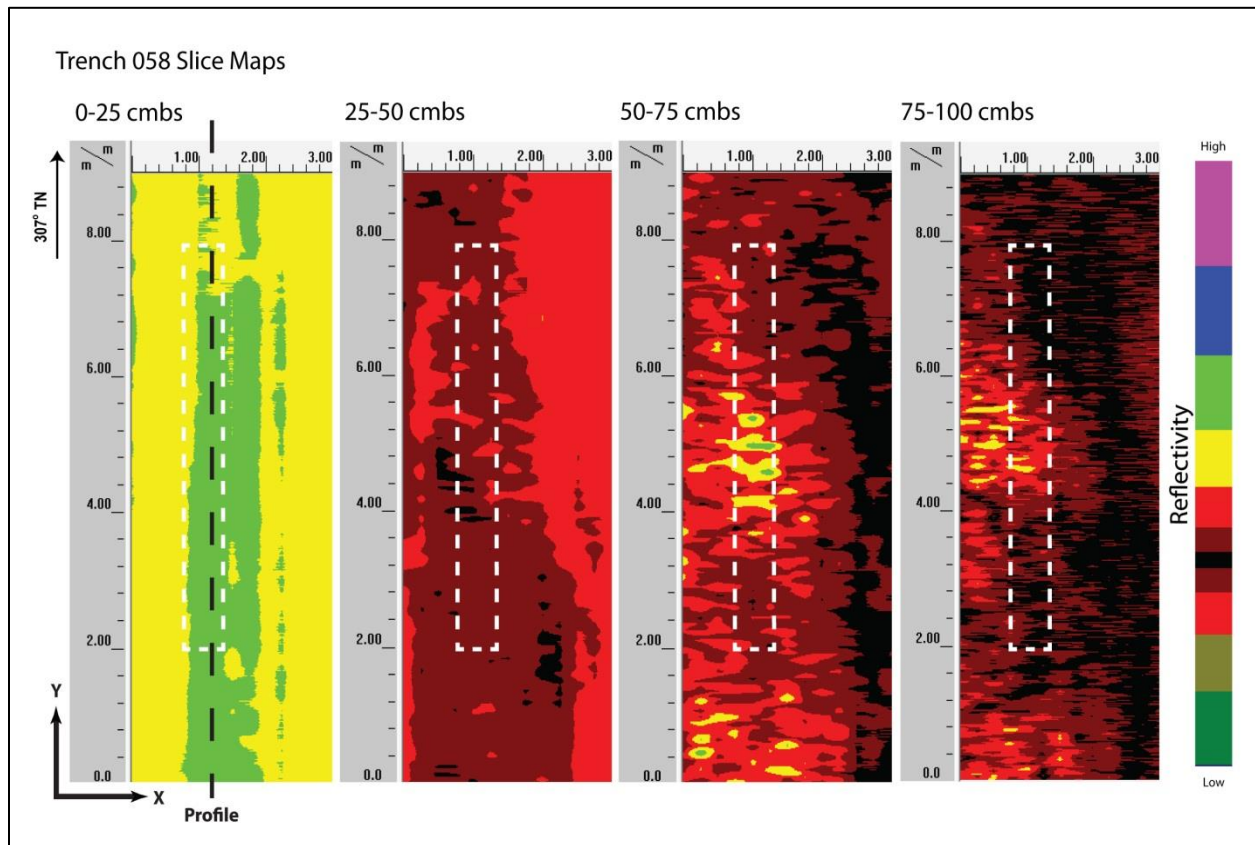


Figure 142. Slice maps of T-058 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 143). Strata included a layer of asphalt (Ia) followed by extremely stony loamy sand (Ib), on top of two layers of gravelly sandy clay fill (Ic-Ie) and extremely gravelly sand (Ie), all which continued down to approximately 1.6 mbs. Strata Ia and Ib were observed in the GPR profile but strata Ic through Ie were not individually discernible, possibly due to the fact that they were all layers of the very similar fill. All other sediment transitions were below the maximum depth of clean signal return. No other discrete objects were observed in the GPR results or subsequent excavation.

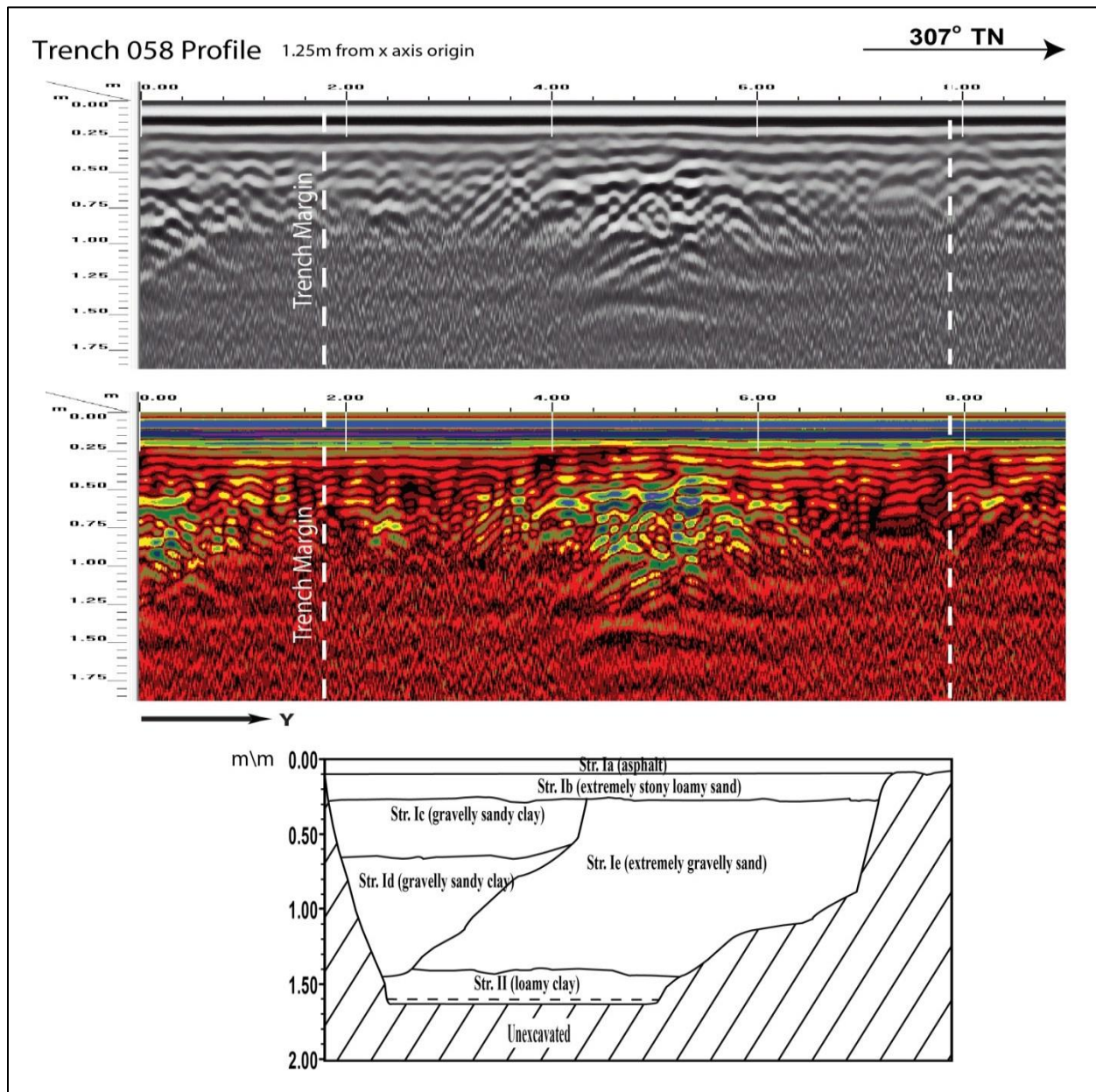


Figure 143. Visual comparison of excavated profile and GPR signal profile of T-058

Test Excavation 59

T-059 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane, 42.0 m northwest of Kapalama Stream. The GPR grid measured 2.5 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer line 2.8 m southwest and a water line 5 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 144).

GPR depth profiles for T-059 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 145). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.5 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.2 mbs.

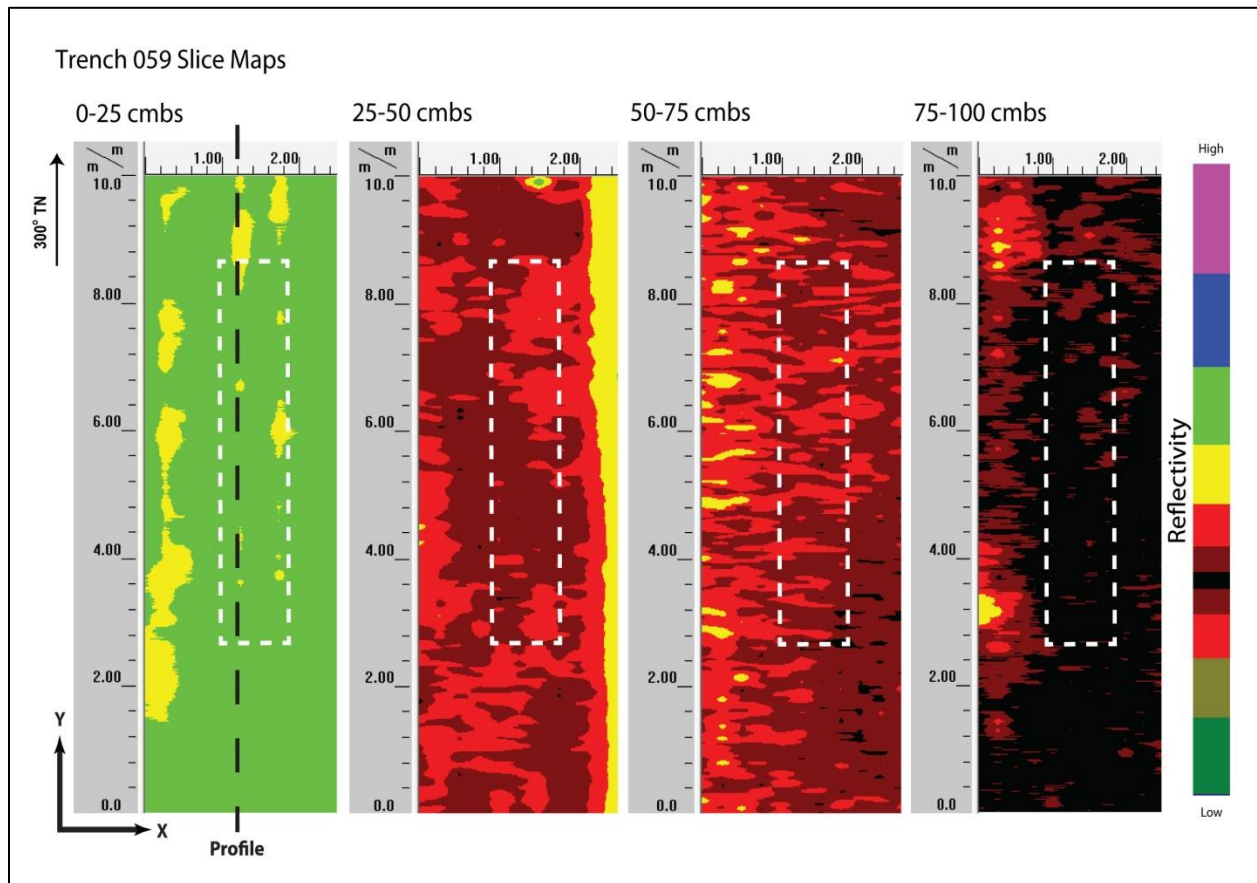


Figure 144. Slice maps of T-059 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 145). Strata included a thin layer of asphalt on top of a thin layer of extremely gravelly loam followed by extremely gravelly sand (CLSM), then a very gravelly sandy loam fill, then an extremely gravelly to cobbly loamy sand fill down to 1.6 mbs. These transitions were clearly depicted in the GPR profile at or very near the depths that they occurred. An increase in reflectivity and textural changes were apparent in the transition to Stratum Ie. All other sediment transitions were below the maximum depth of clean signal return. No discrete objects were observed in the GPR results or subsequent excavation.

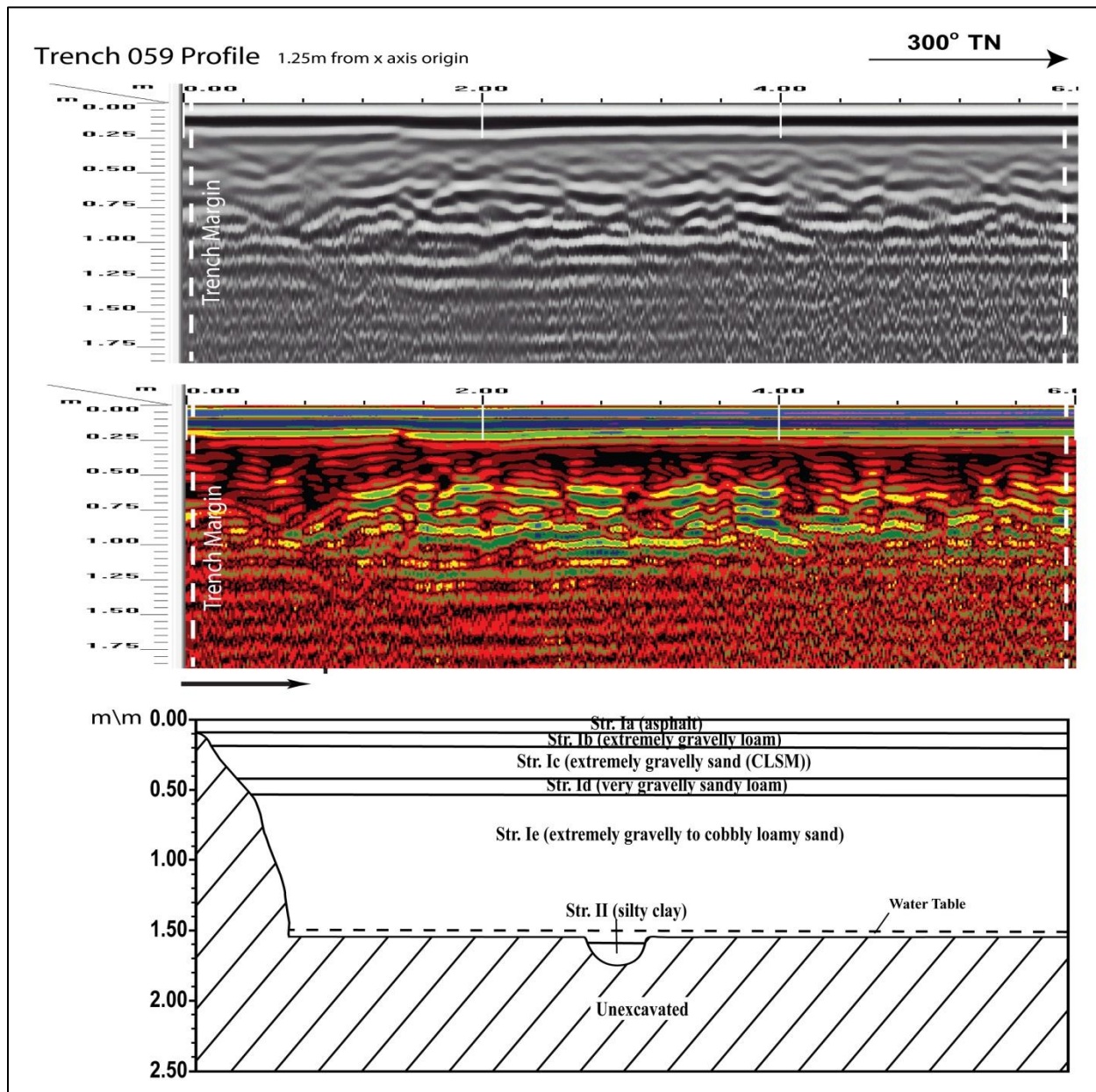


Figure 145. Visual comparison of excavated profile and GPR signal profile of T-059

Test Excavation 60

T-060 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located 33 m south of Dillingham Boulevard and Kokea Street intersection, within a parking lot south of Dillingham Boulevard. The GPR grid measured 9.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 2.2 m southeast.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 146).

GPR depth profiles for T-060 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 147). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.9 mbs.

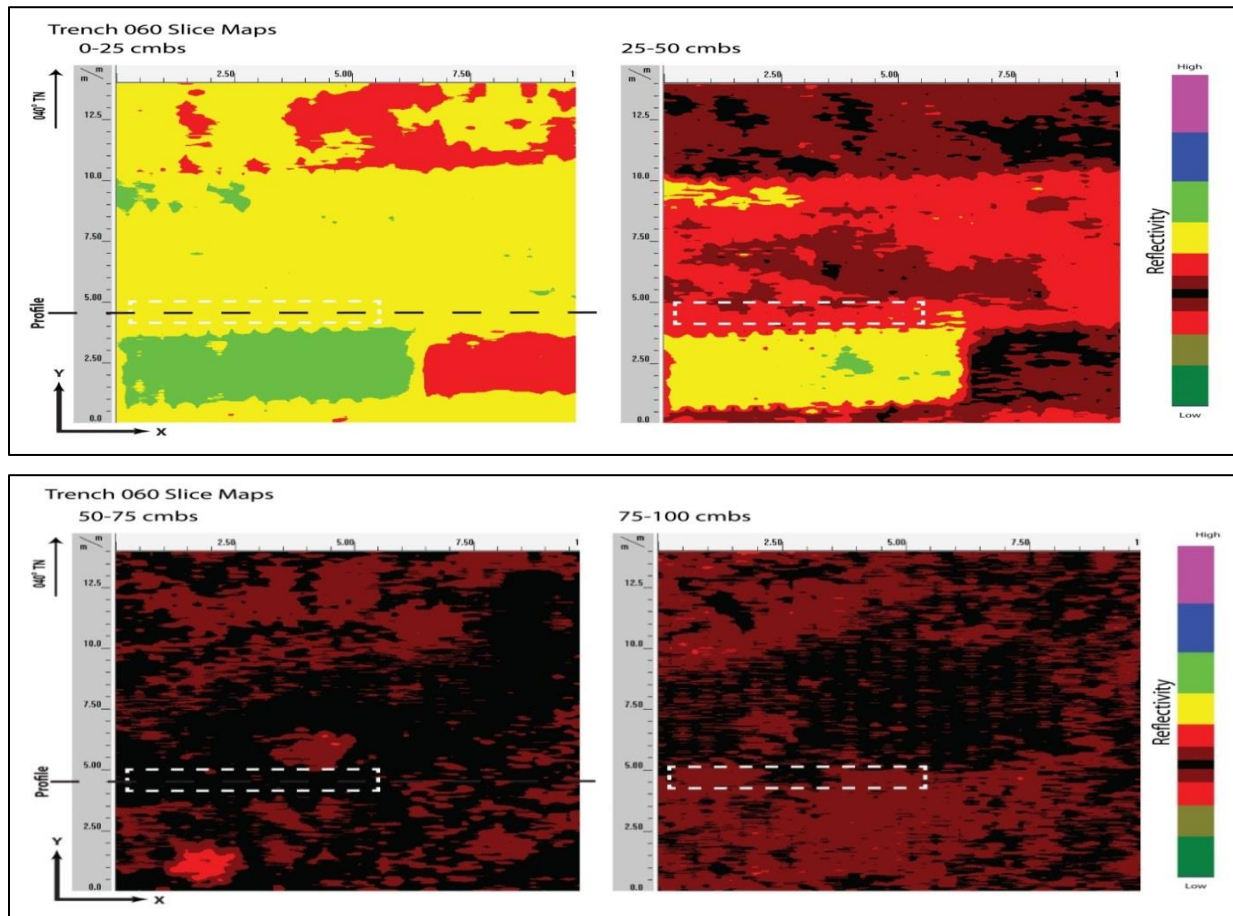


Figure 146. Slice maps of T-060 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 147). Strata included: asphalt, very gravelly sand fill, loamy clay fill, extremely gravelly sand, loamy sand fill, very gravelly sand fill, natural sand, natural silty clay and the coral shelf. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

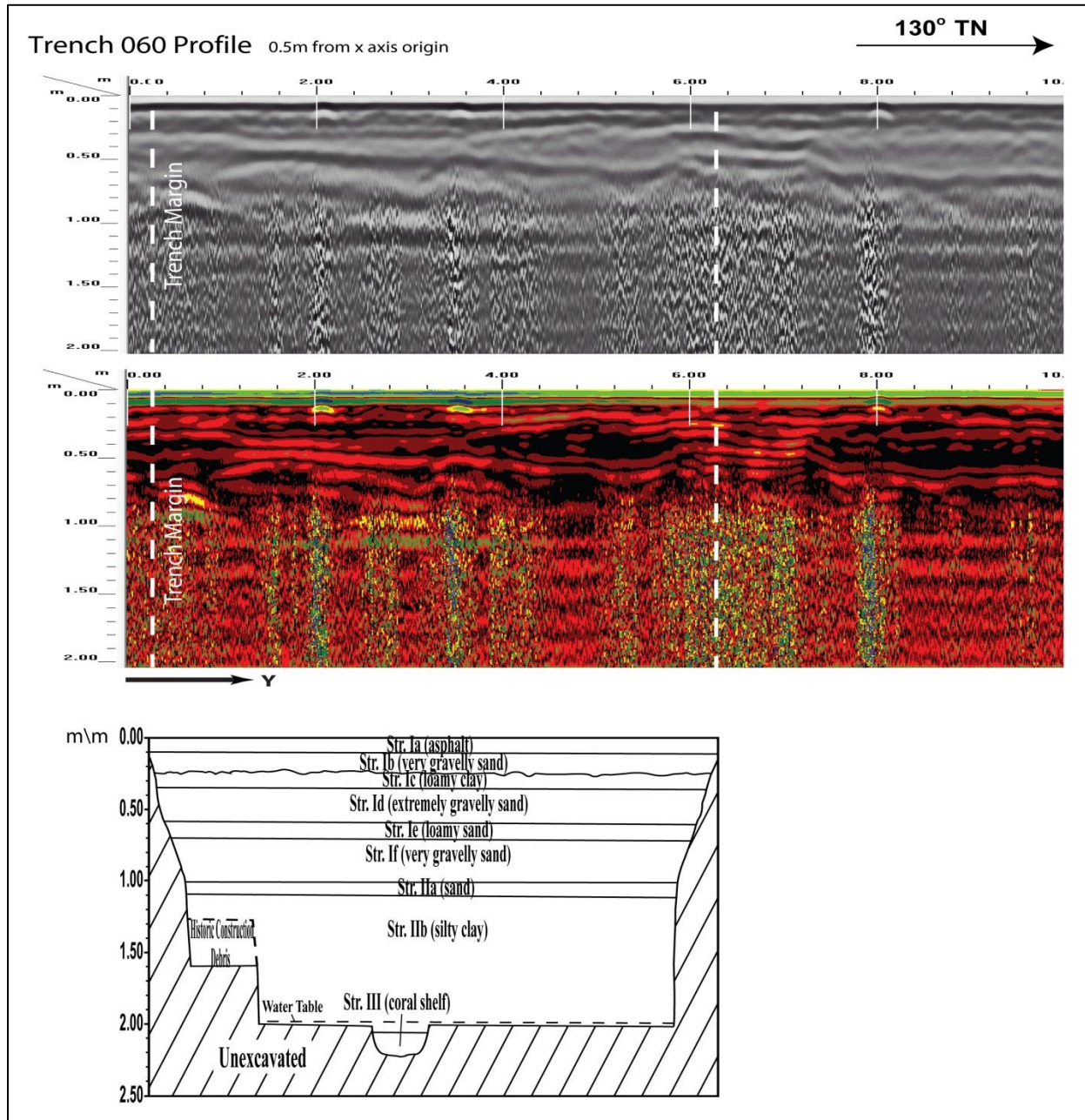


Figure 147. Visual comparison of excavated profile and GPR signal profile of T-060

Test Excavation 61

T-061 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located 25.0 m south of Dillingham Boulevard and Kokea Street, within a parking lot south of Dillingham Boulevard. The GPR grid measured 9.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 5 m southeast. A pipe was encountered 1.25 mbs in the center of the excavation.

A review of amplitude slice maps indicated no linear features although a pipe was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 148).

GPR depth profiles for T-061 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 149). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. No utilities were observed in the profile although a pipe was encountered during excavation. The maximum depth of clean signal return was approximately 0.75 mbs.

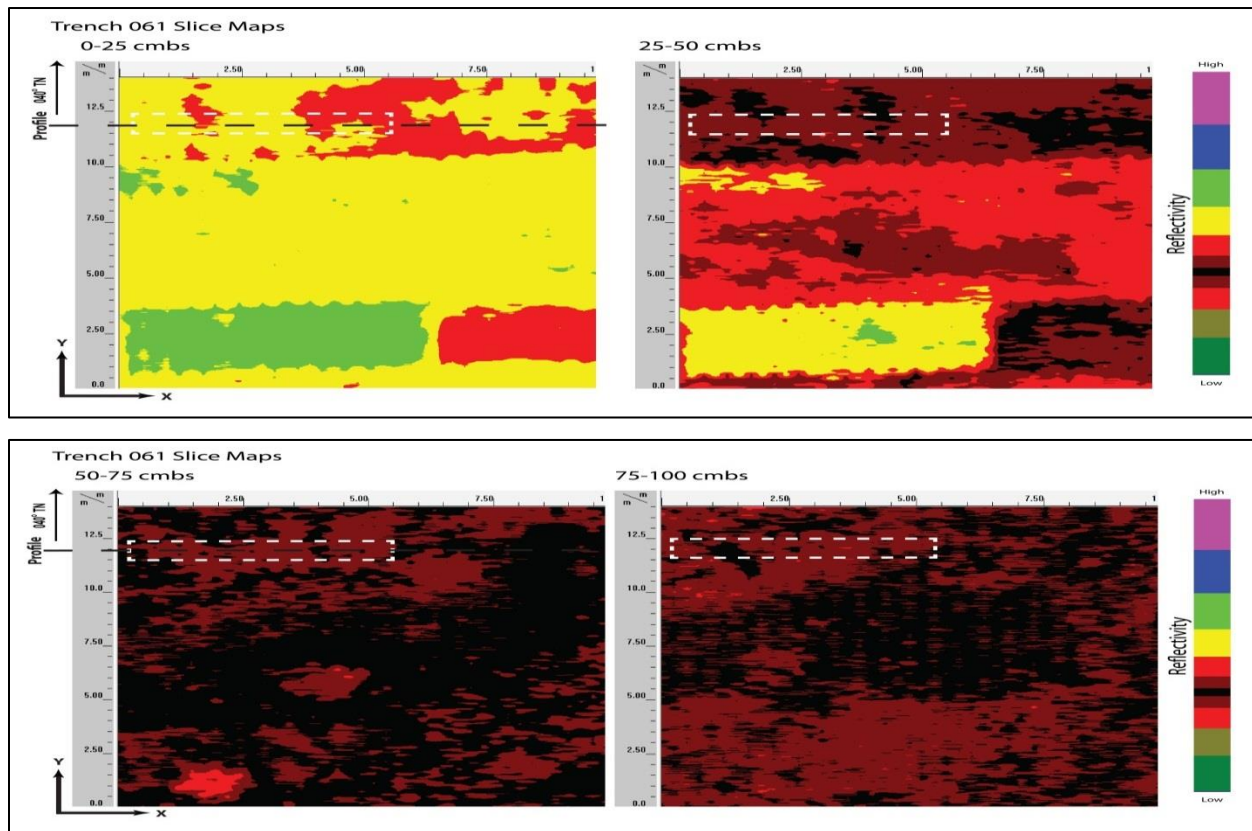


Figure 148. Slice maps of T-061 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 149). Strata Ia and Ie were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ie which was extremely gravelly sandy clay fill. All other sediment transitions were below the maximum clean signal return depth. A pipe was found 1.25 mbs. The pipe did not show up on the profile or slice maps. This may be due to the fact that the pipe was below the maximum depth of clean signal return. No discrete objects were observed in the GPR results.

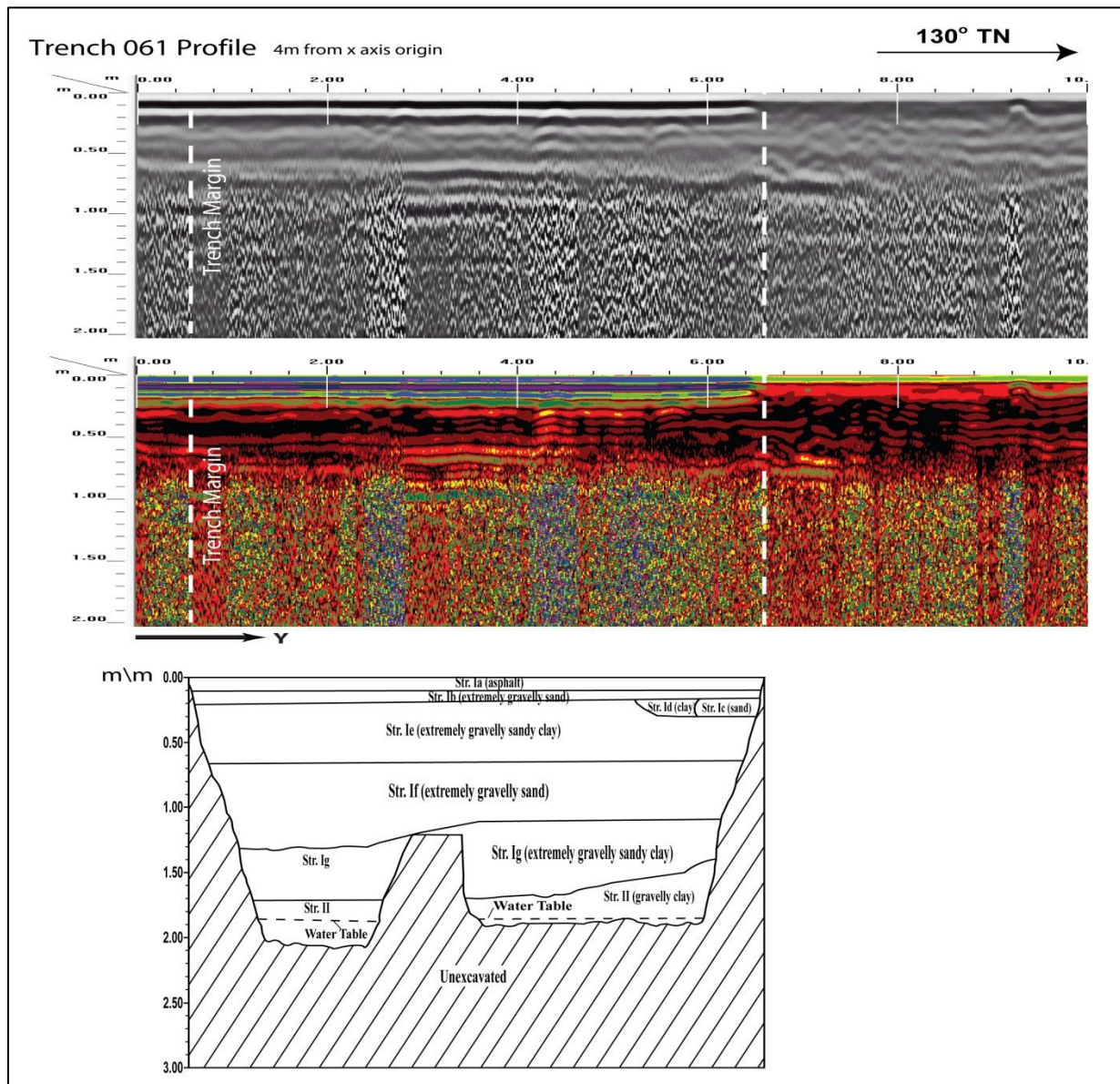


Figure 149. Visual comparison of excavated profile and GPR signal profile of T-061

Test Excavation 62

T-062 measured 1.0 m by 6.0 m and was oriented northeast to southwest and was located within a grassy field on Honolulu Community College, 22.0 m southeast of Kapalama Stream, 9 m southeast of Kokea Street. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a water line 8.9 m northwest. A concrete jacket was encountered 0.21 mbs on the northeast end of the excavation.

A review of amplitude slice maps indicated no linear features although a concrete jacket was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 150).

GPR depth profiles for T-062 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 151). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs and again around 0.4 mbs. No utilities were observed in the profile although a concrete jacket was encountered during excavation. The maximum depth of clean signal return was approximately 1.1 mbs.

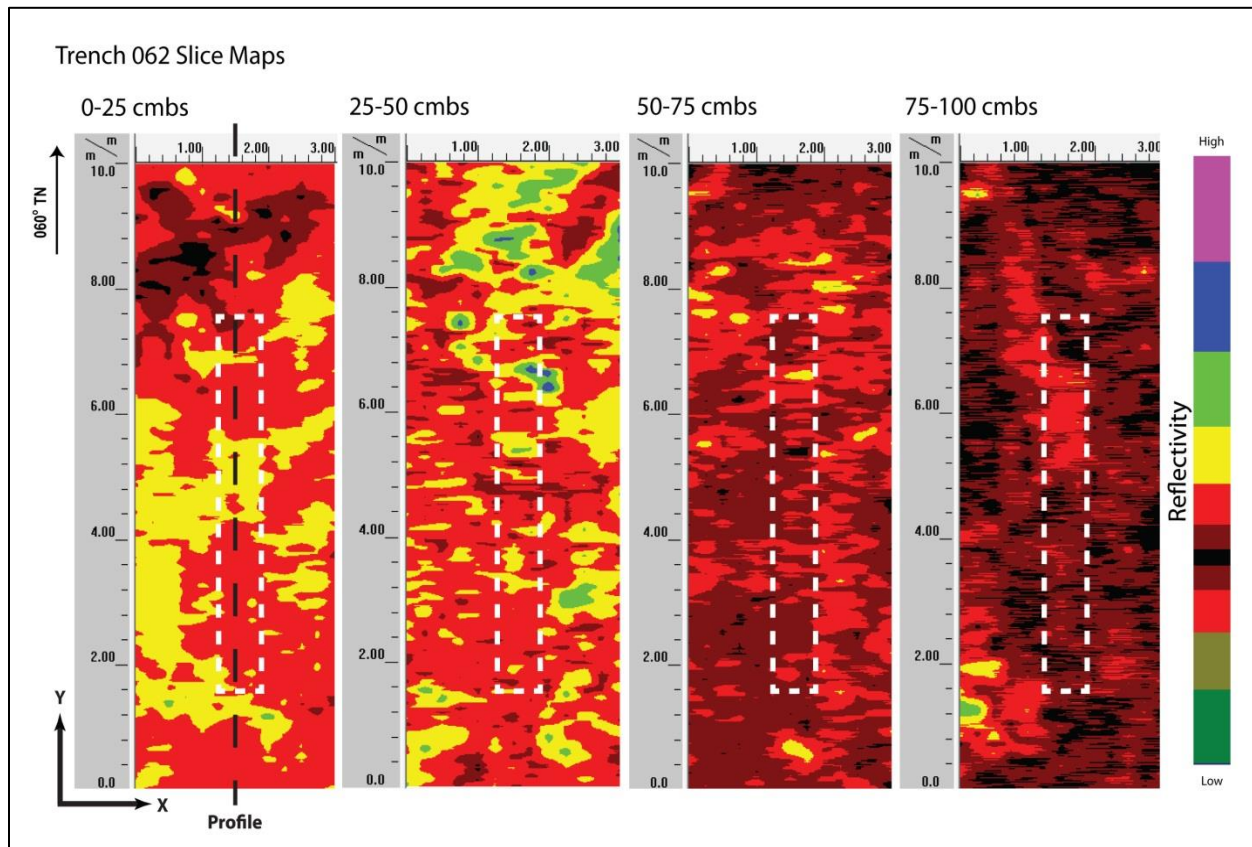


Figure 150. Slice maps of T-062 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 151). Strata Ia to Ic were all clearly observed and occurred near the ground-truthed depths. A concrete slab was found 0.21 mbs. This concrete jacket did not show up on the profile or slice maps. This may be due to the fact that the concrete did not have reinforced steel (rebar). All other sediment transitions were below the maximum depth for clean signal return. No other discrete were observed in the GPR results or subsequent excavation.

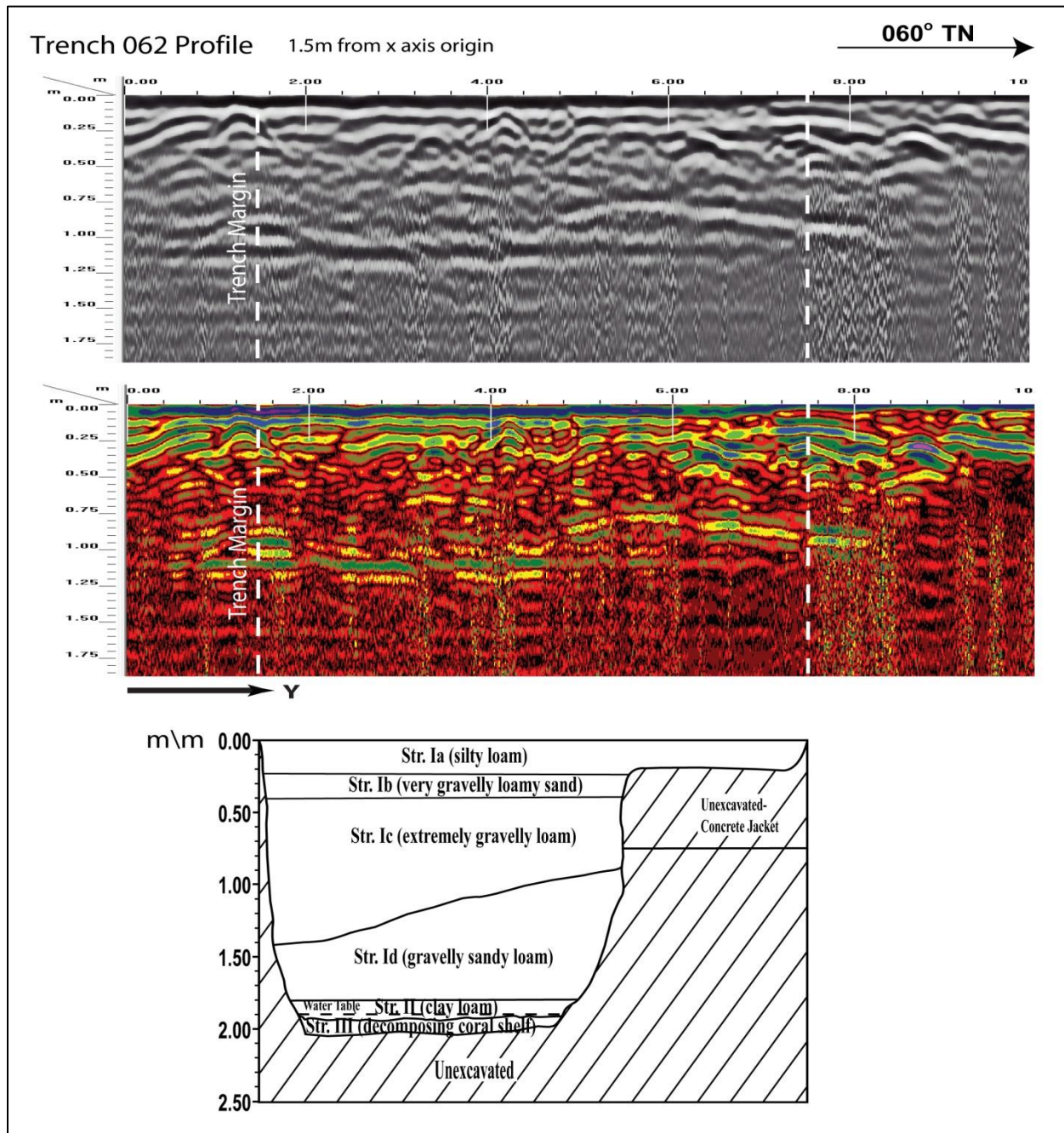


Figure 151. Visual comparison of excavated profile and GPR signal profile of T-062

Test Excavation 63

T-063 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located 43.0 m southeast of Dillingham Boulevard and Kokea Street intersection, within a parking lot south of Dillingham Boulevard and fronting Mix Plate Cafe. The GPR grid measured 9.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 4.2 m northwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (

Figure 152).

GPR depth profiles for T-026 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 153). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.35 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

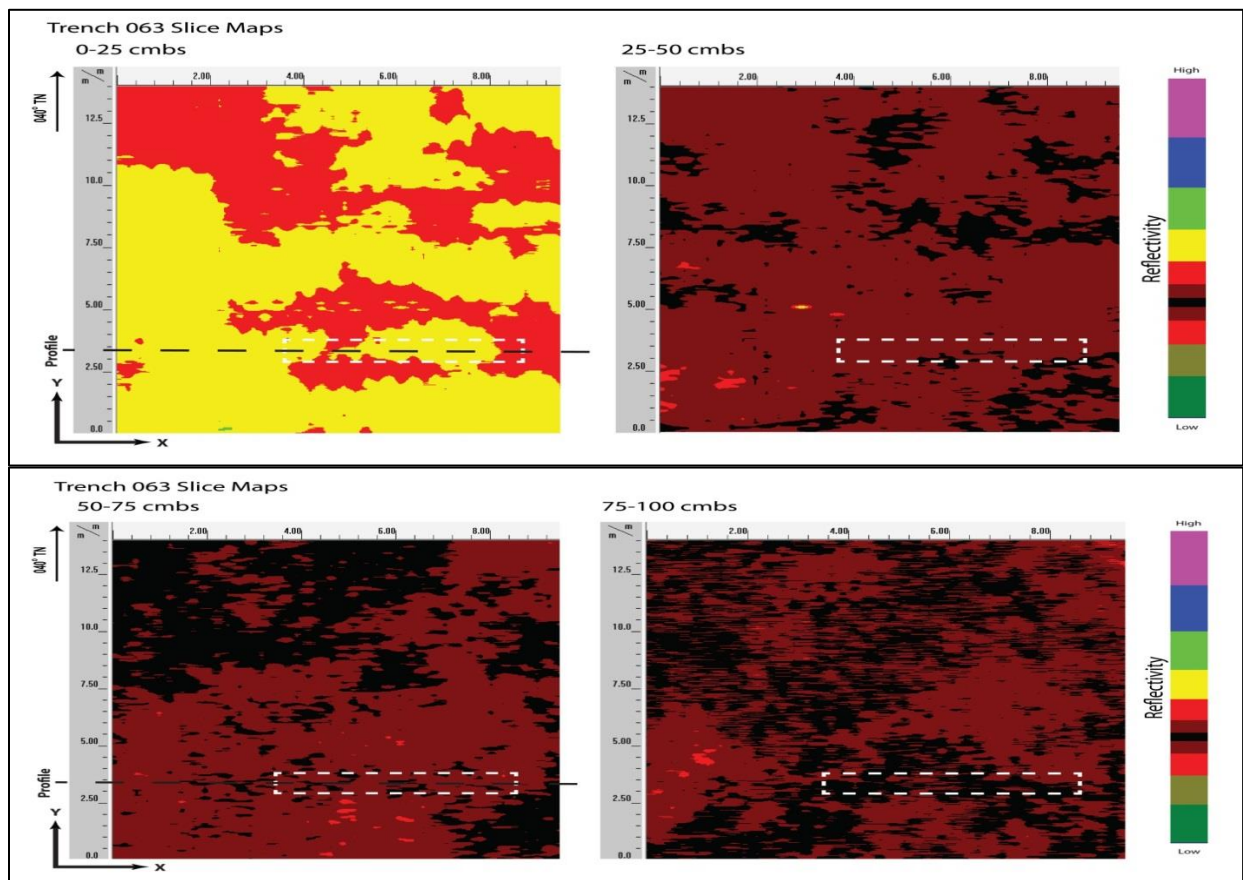


Figure 152. Slice maps of T-063 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 153). Strata included: asphalt, extremely gravelly sandy clay loam fill, very gravelly sand fill, extremely gravelly sandy loam fill, gravelly silty clay loam fill, very gravelly silty sand fill, very gravelly sand fill, silty clay fill, very gravelly sand fill, natural silty clay and natural very gravelly sandy clay loam. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

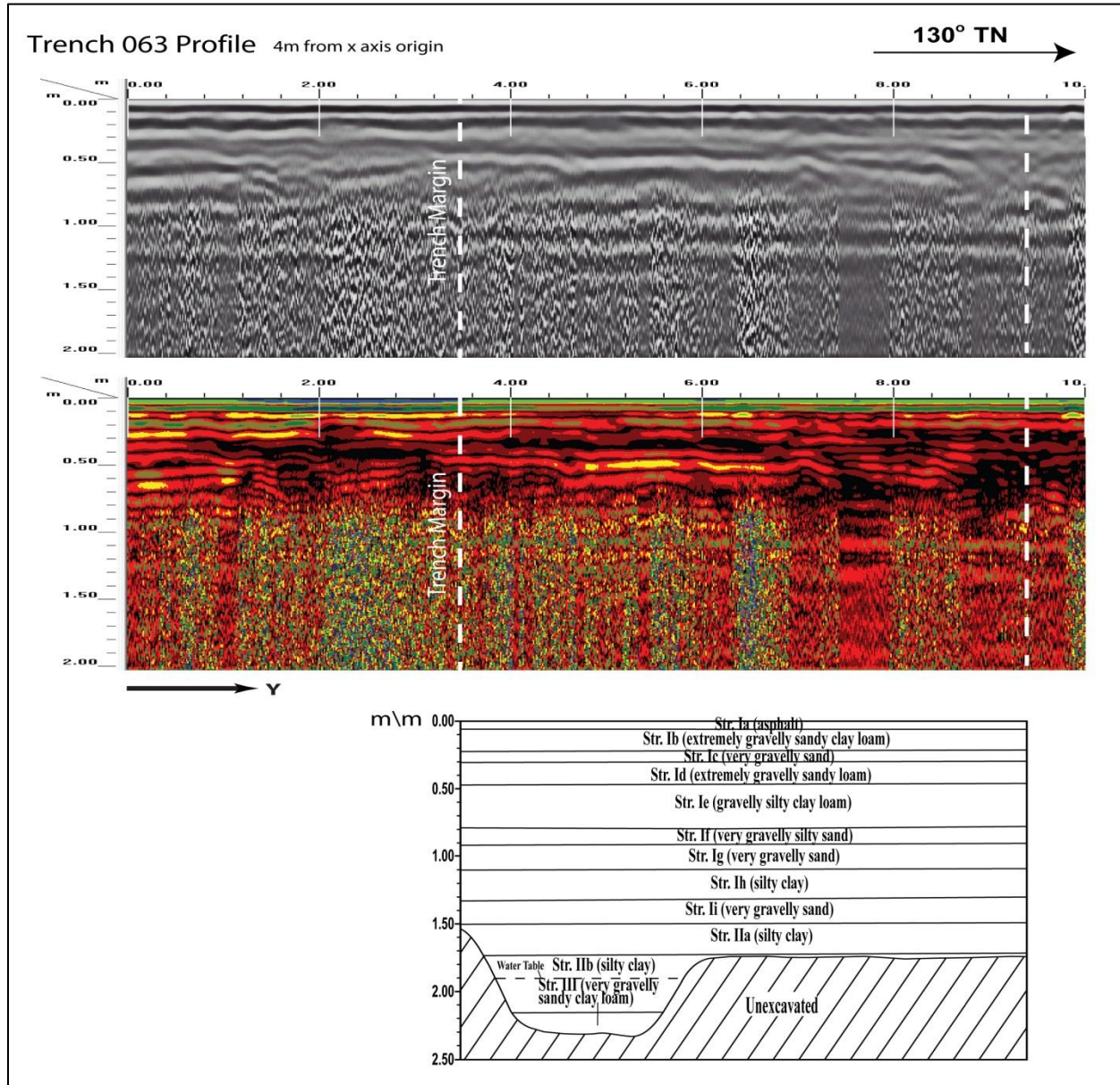


Figure 153. Visual comparison of excavated profile and GPR signal profile of T-063

Test Excavation 64

T-064 measured 0.6 m by 6.0 m and was oriented east to west was located within a grassy field on Honolulu Community College, 30.0 m southeast of Kapalama Stream, 33.0 m east of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 3.2 m by 10 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a sewer line 13.8 m northwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 154).

GPR depth profiles for T-064 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 155). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.75 mbs.

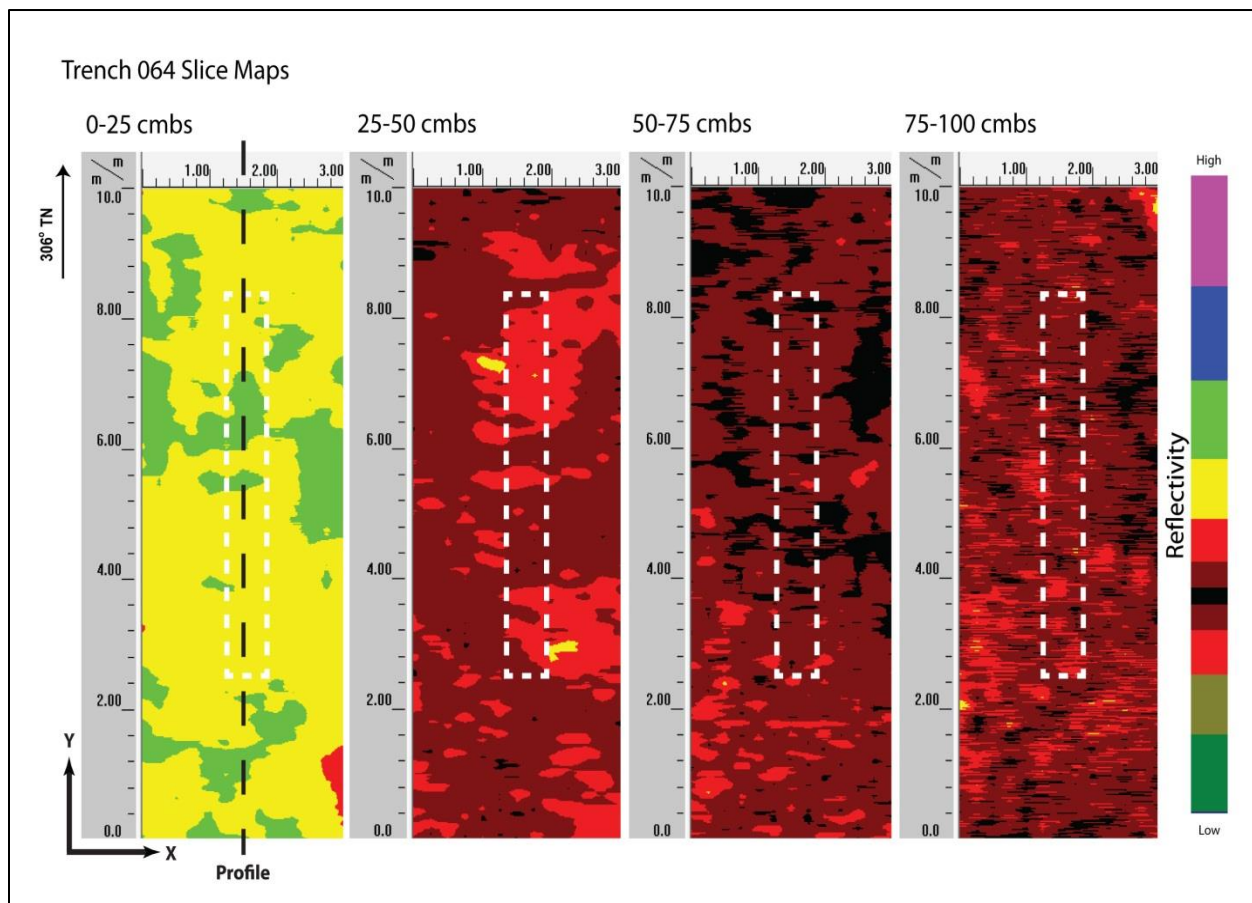


Figure 154. Slice maps of T-064 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 155). Strata included a layer of silty loam fill on top of silty sand fill followed by sand fill, then silty sand fill, and then sandy loam fill. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. All other sediment transitions occurred below the maximum clean signal depth. No discrete objects were observed in the GPR results or subsequent excavation.

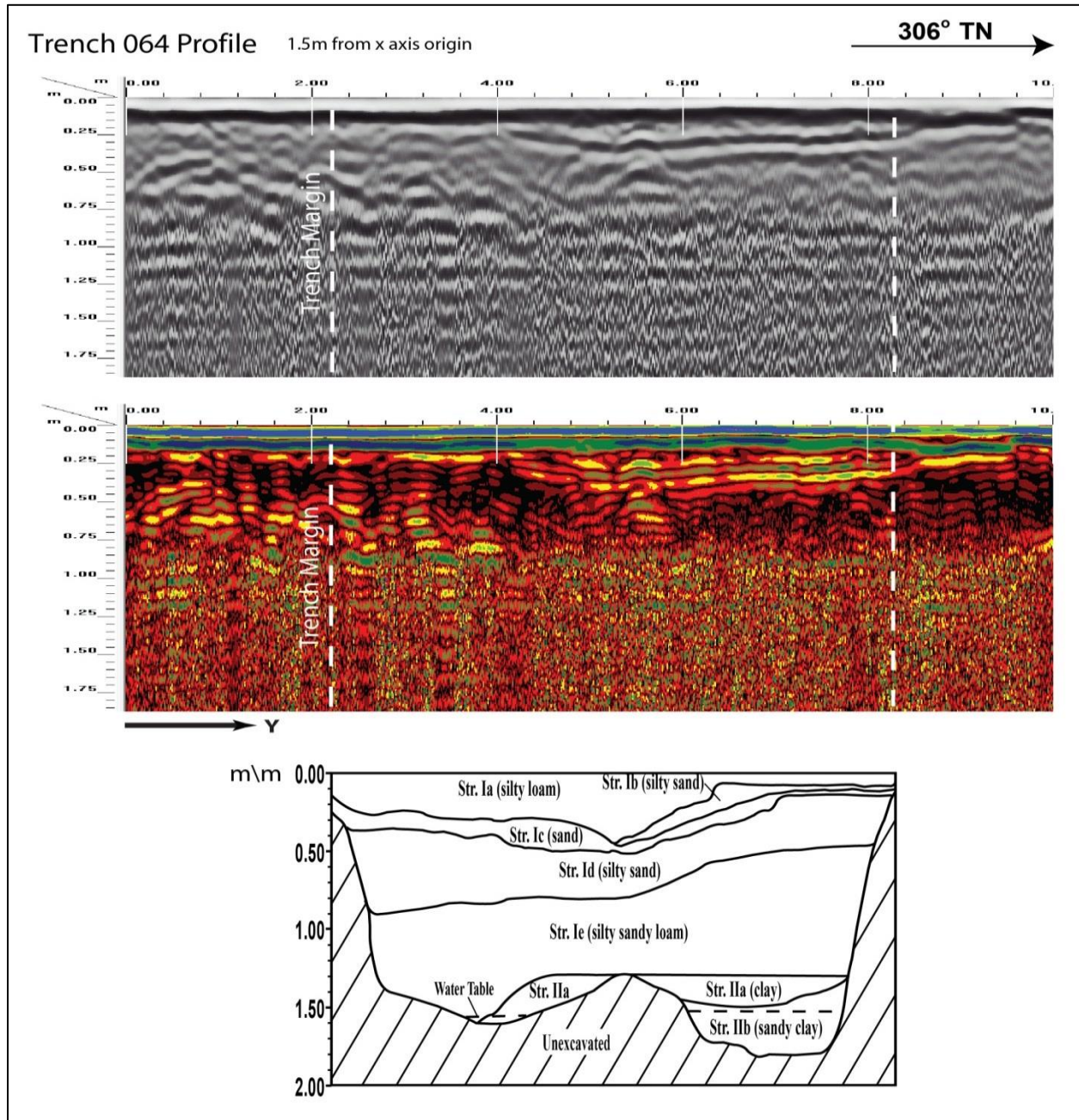


Figure 155. Visual comparison of excavated profile and GPR signal profile of T-064

Test Excavation 65

T-065 measured 0.6 m by 6.0 m and was oriented northeast to southwest and was located within a grassy field on Honolulu Community College, 20.0 m southeast of Kapalama Stream, 68.0 m northeast of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a water line 8.6 m northwest. An electrical utility was encountered 0.75 mbs running diagonally through the northeast end of the excavation.

A review of amplitude slice maps indicated no linear features although an electrical utility was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 156).

GPR depth profiles for T-065 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 157). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. No utilities were observed in the profile although an electrical utility was encountered during excavation. The maximum depth of clean signal return was approximately 0.8 mbs.

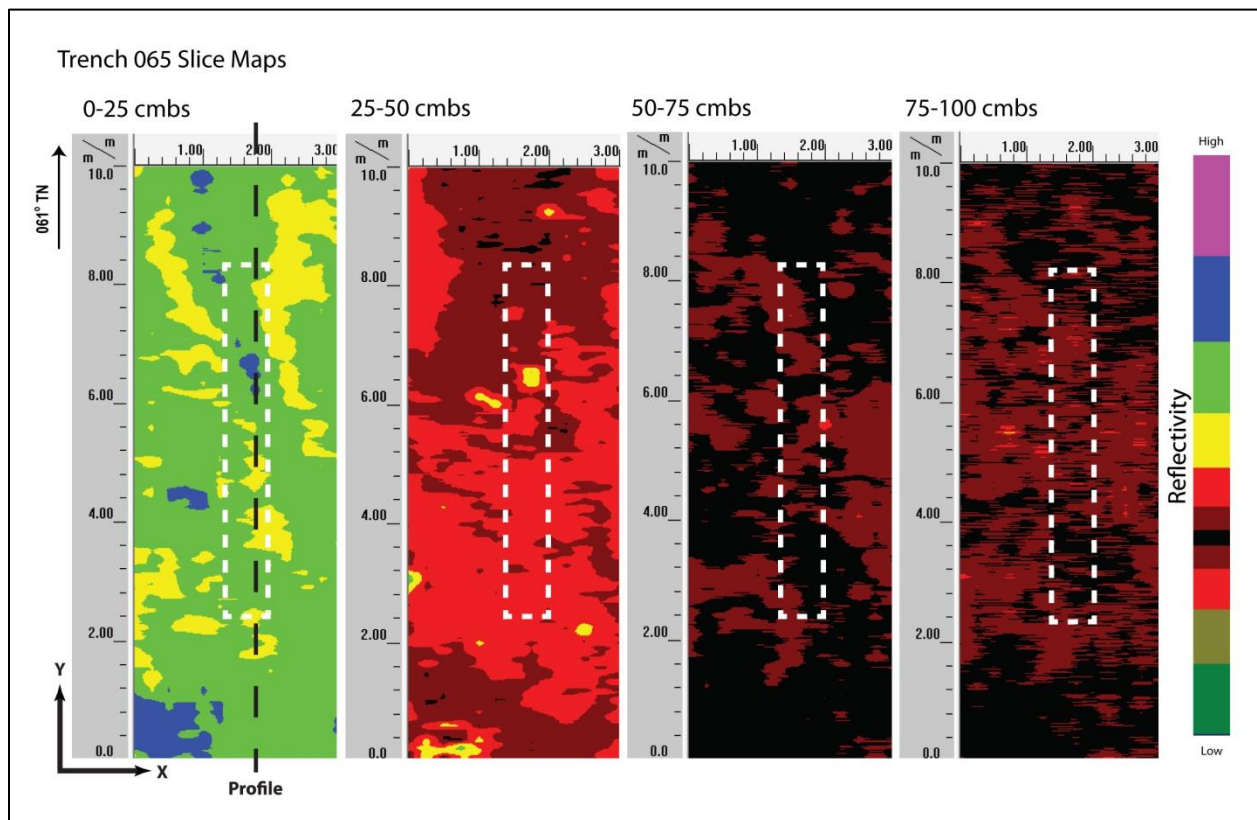


Figure 156. Slice maps of T-065 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 157). Strata included a thin layer of silty loam fill on top of very sandy silt fill followed by sand fill and then slightly gravelly silt loam that continues down to 1.5 mbs. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. All other sediment transitions occurred below the maximum depth of clean signal return. An electrical utility was found 0.75 mbs. This utility did not show up on the profile or slice maps. This may be due to the fact that it was comprised of PVC or that the pipe was very small and bordering on the maximum depth of clean signal return. No other discrete objects were observed in the GPR results or subsequent excavation.

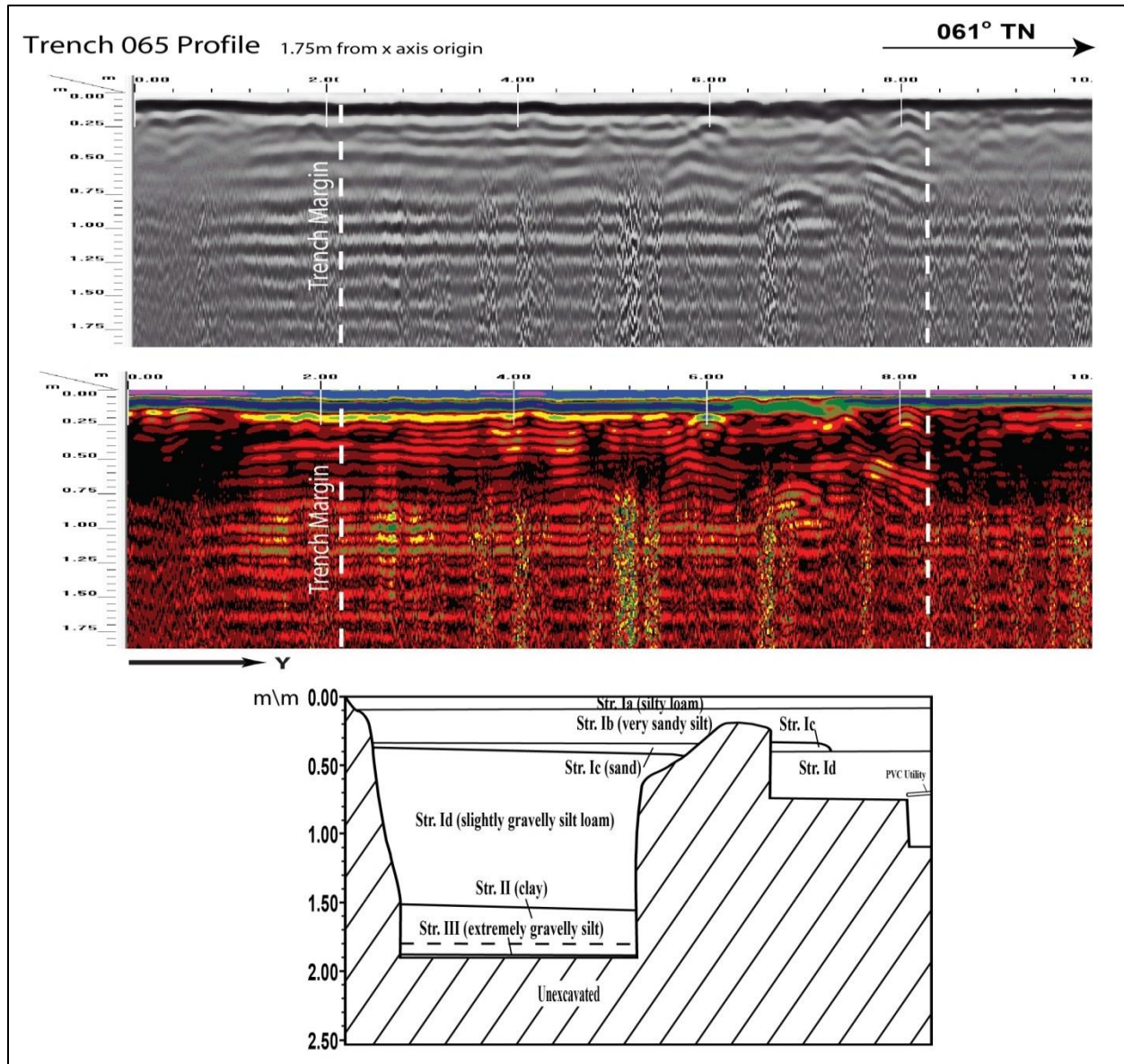


Figure 157. Visual comparison of excavated profile and GPR signal profile of T-065

Test Excavation 66

T-066 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within a grassy field at Honolulu Community College, 30.0 m southeast of Kapalama stream, 47.0 m northeast of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between y transects and 1.0 m spacing between X transects. No utilities within close proximity to the excavation location. An irrigation pipe was encountered approximately 0.45 mbs in the center of the excavation.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 158).

GPR depth profiles for T-066 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 159). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile although an irrigation pipe was encountered during excavation. The maximum depth of clean signal return was approximately 0.9 mbs.

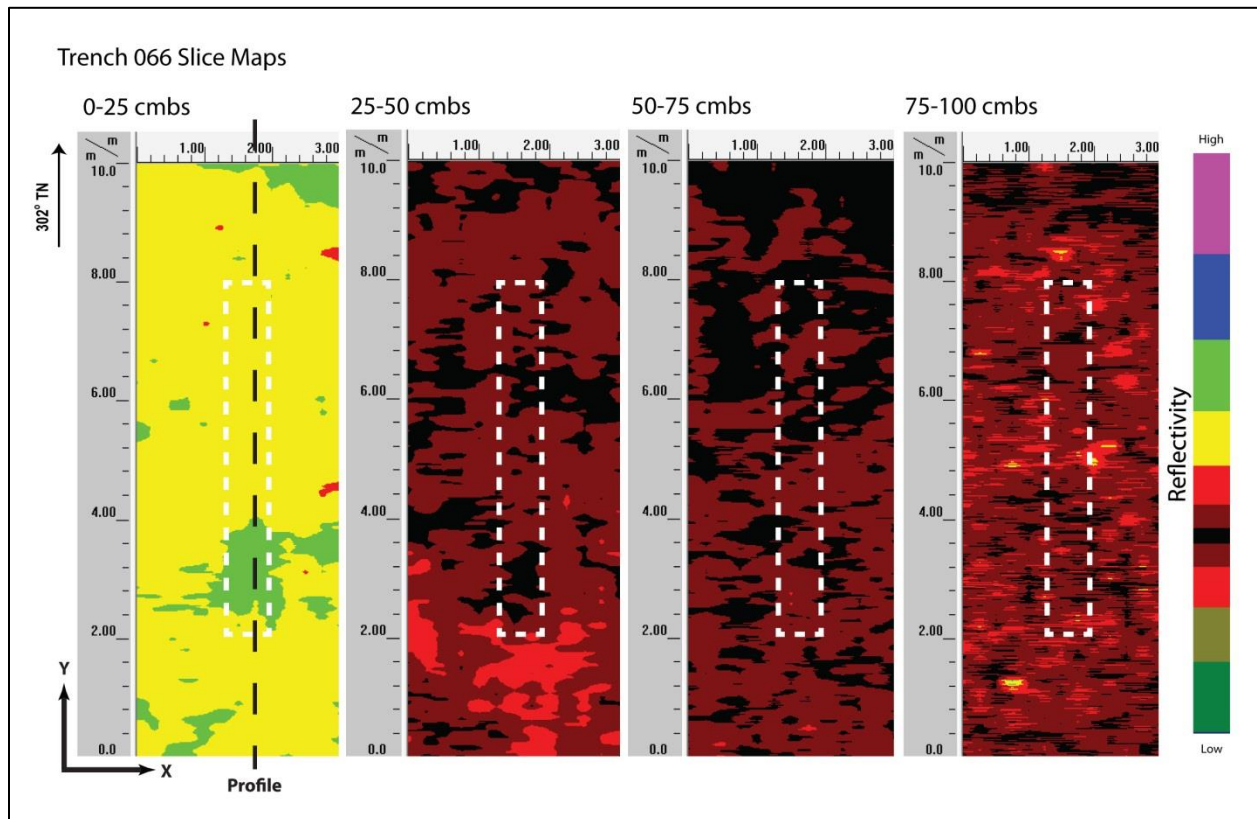


Figure 158. Slice maps of T-066 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 159). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was incinerator refuse. A PVC irrigation line was encountered 0.45 mbs. The pipe did not show up on the profile or slice maps. This may be due to the fact that the line was comprised of PVC or because it was very small and empty. No other discrete objects were observed in the GPR results or subsequent excavation.

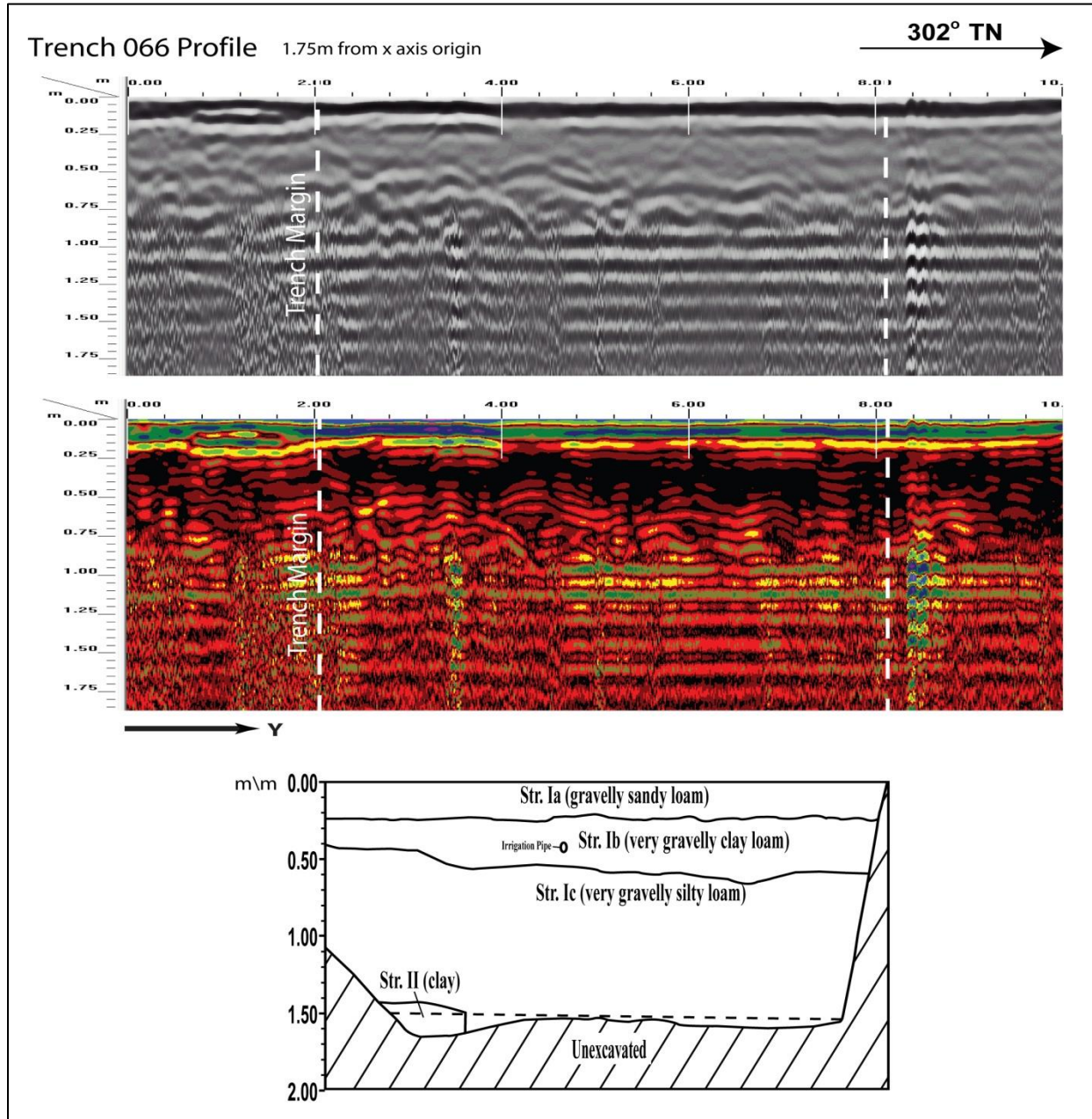


Figure 159. Visual comparison of excavated profile and GPR signal profile of T-066

Test Excavation 67

T-067 measured 0.6 m by 6.0 m and was oriented northeast to southwest and was located within a parking lot, 25.0 m southeast of Kapalama Stream and 66.0 m northeast of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a water line 13.0 m northwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 160).

GPR depth profiles for T-067 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 161). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.8 mbs.

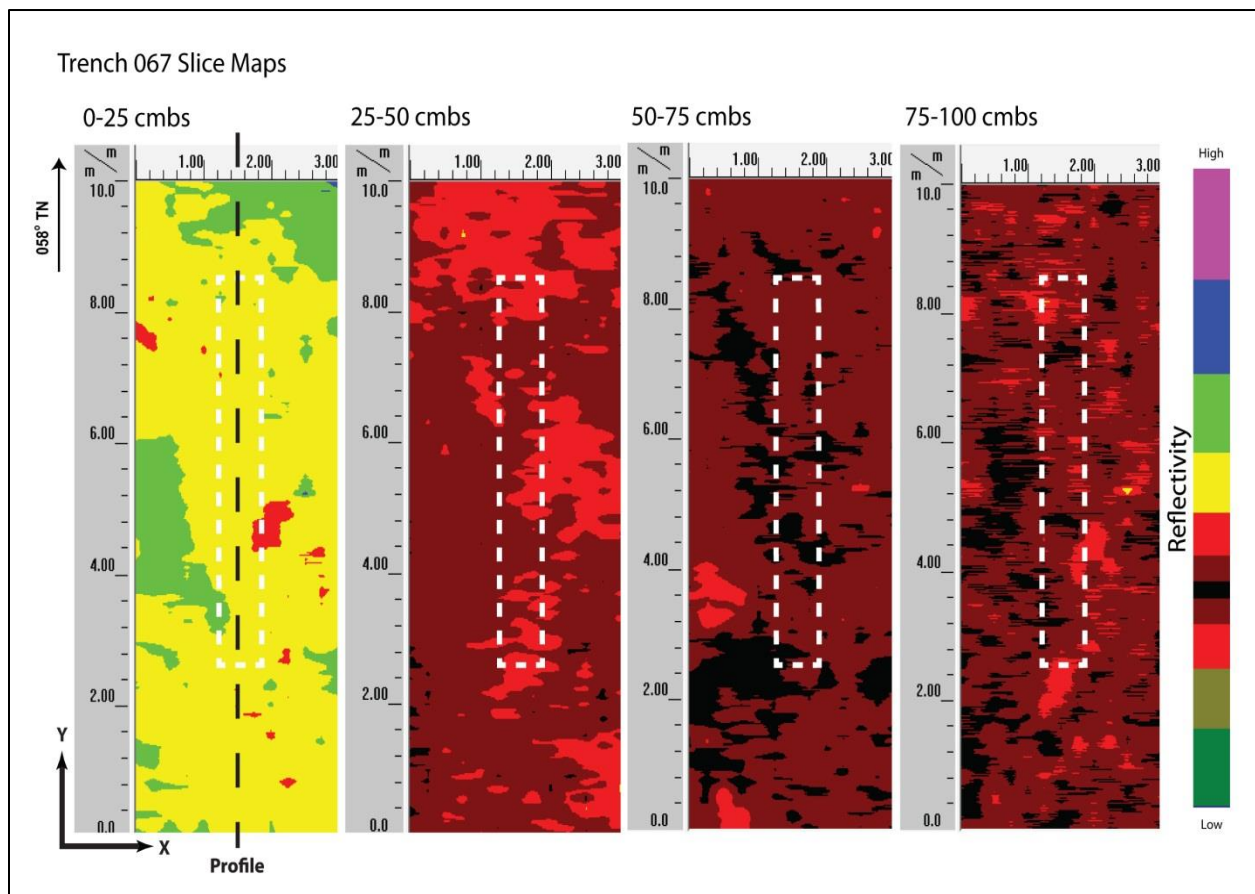


Figure 160. Slice maps of T-067 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 161). Strata included a layer of very gravelly sandy loam fill on top of a very gravelly loamy sand fill which continued down to 1.5 mbs. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. All other sediment transitions occurred below the maximum clean signal return depth. No discrete objects were observed in the GPR results or subsequent excavation.

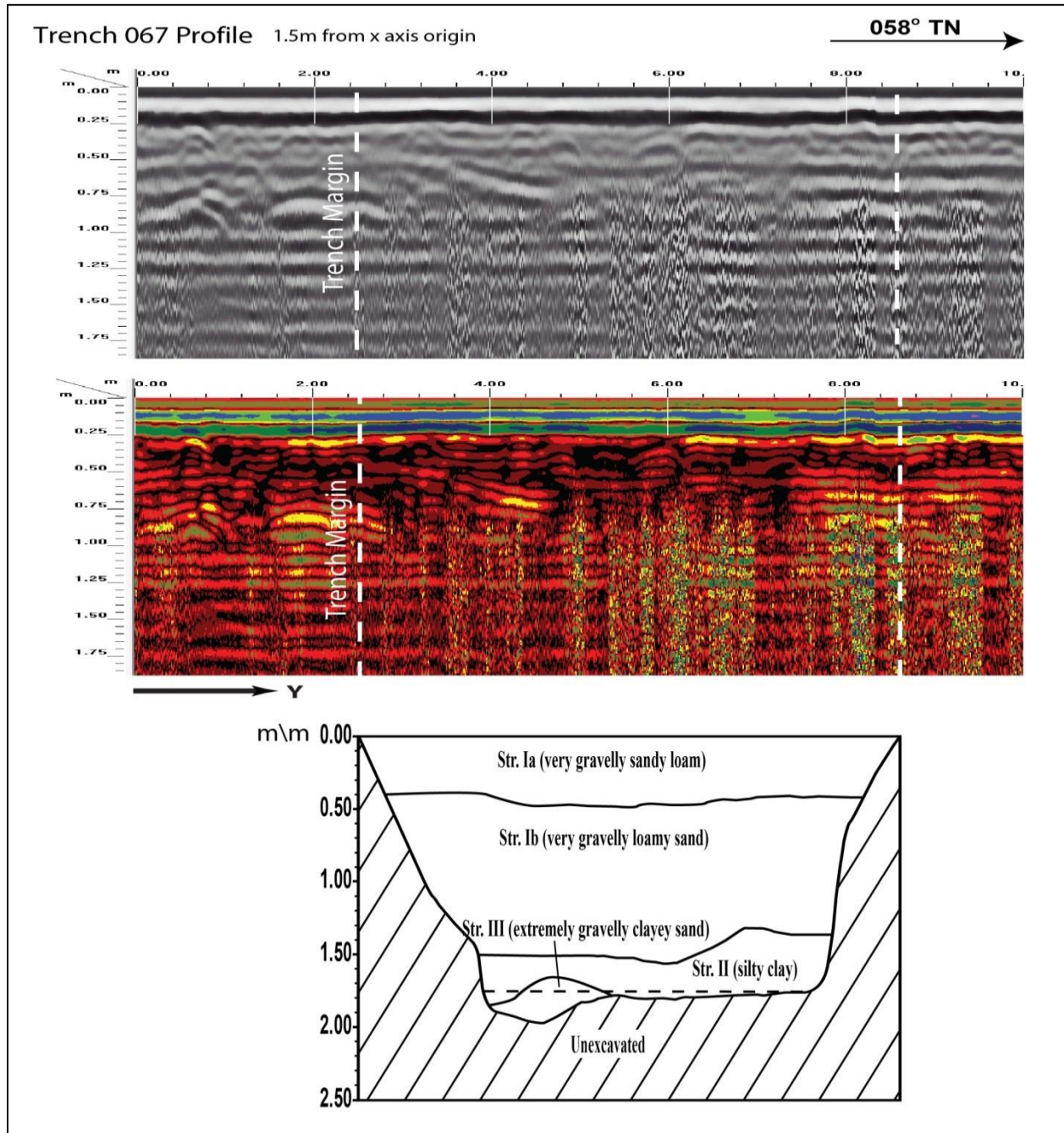


Figure 161. Visual comparison of excavated profile and GPR signal profile of T-067

Test Excavation 68

T-068 measured 0.6 m by 6.0 m and was oriented northeast to southwest, and was located 40.0 m southeast of Dillingham Boulevard and Kokea Street intersection, within a parking lot south of Dillingham Boulevard and fronting Mix Plate Cafe. The GPR grid measured 9.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 2.5 m northwest. An irrigation line was encountered 0.1 mbs and a concrete slab was encountered approximately 0.3 mbs in the northeast end of the excavation.

A review of amplitude slice maps indicated no linear features although an irrigation line was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 162).

GPR depth profiles for T-068 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 163). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.1 mbs. No utilities were observed in the profile although a utility was encountered during excavation. The maximum depth of clean signal return was approximately 1.1 mbs.

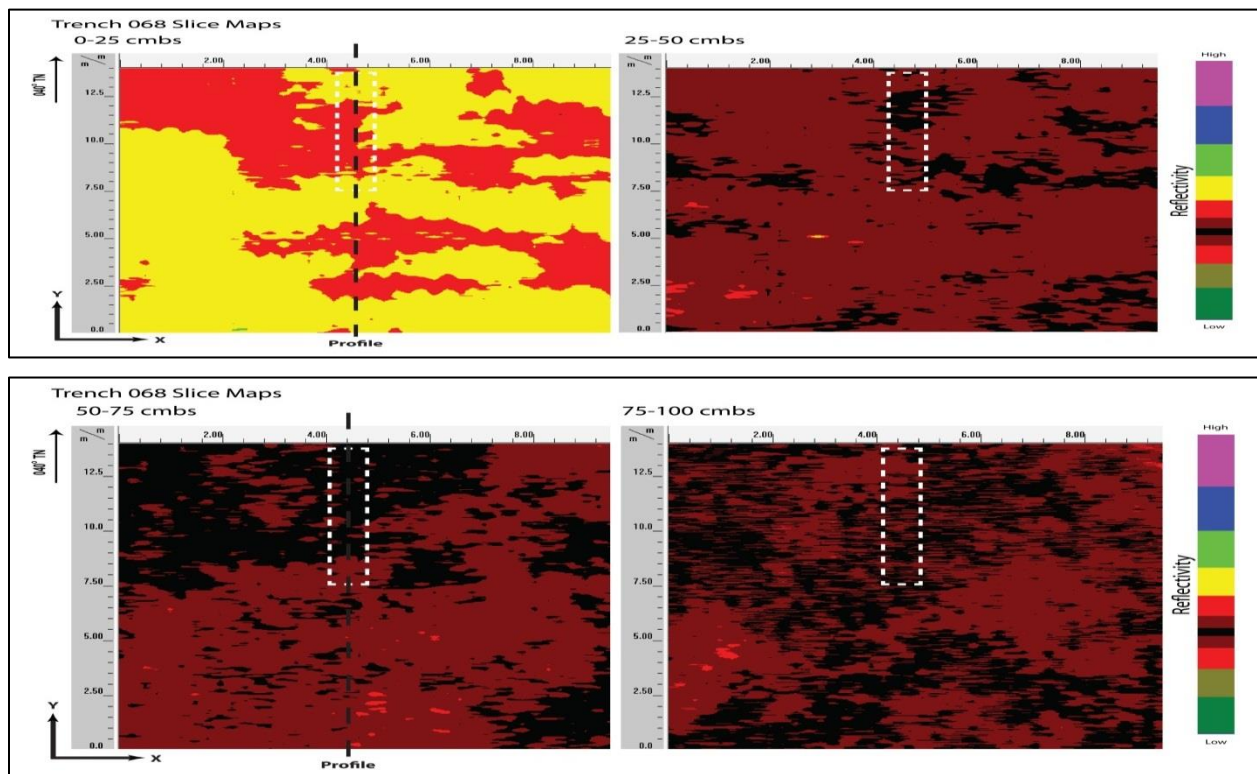


Figure 162. Slice maps of T-068 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 163). Strata Ia, Ic and If were all clearly observed and occurred near the ground-truthed depths. An irrigation line was found 0.1 mbs. This line did not show up on the profile or slice maps. This may be due to the fact that it was comprised of PVC, a small pipe or that it was empty. A concrete slab was also found 0.3 mbs and did not show up on the slice maps or profile. This may be due to the fact that it was not reinforced with steel (rebar) or that it had a similar density to the surrounding stratum. No other discrete objects were observed in the GPR results or subsequent excavation.

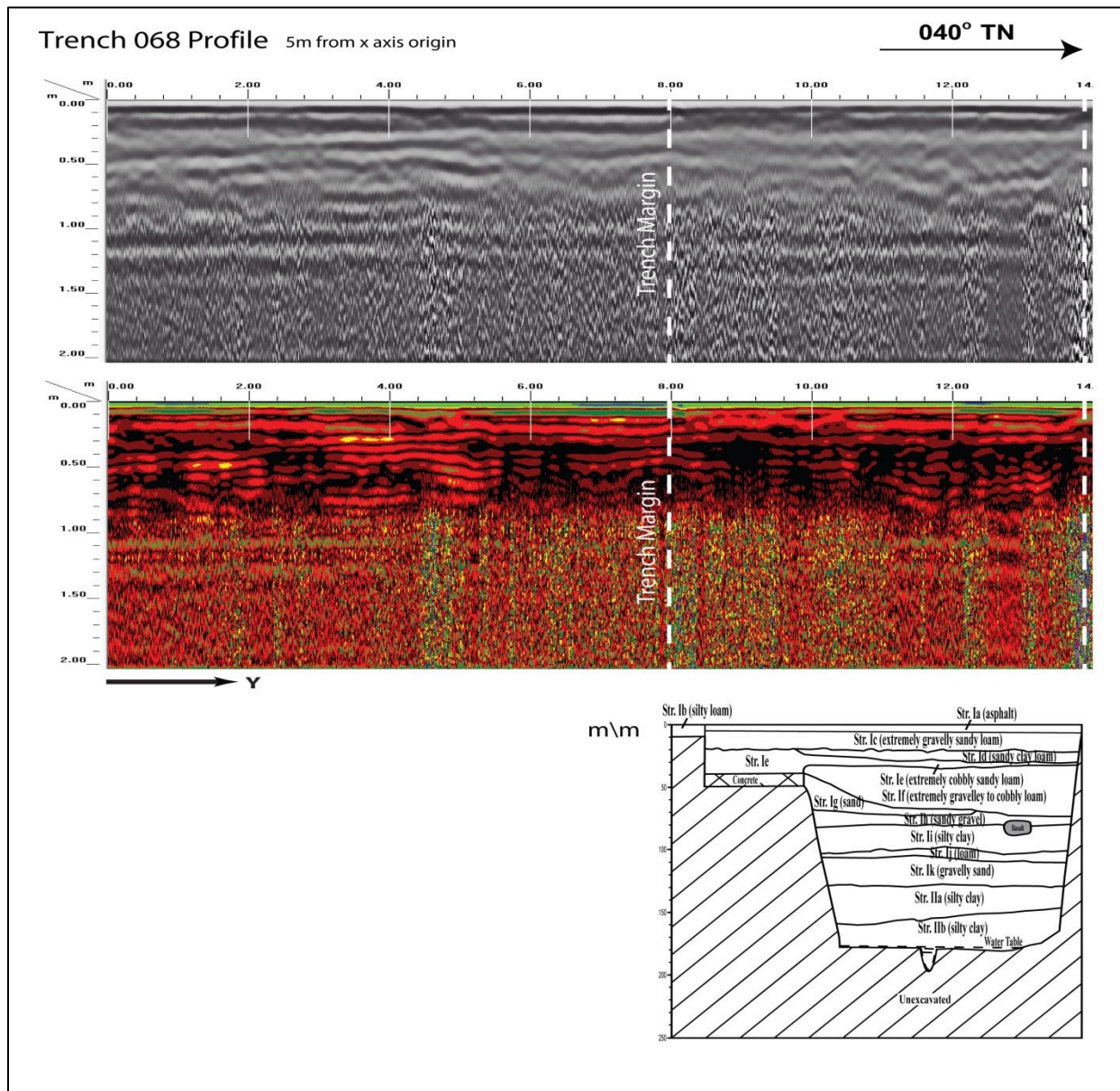


Figure 163. Visual comparison of excavated profile and GPR signal profile of T-068

Test Excavation 69

T-069 measured 0.9 m by 6.0 m and was oriented east to west and was located in a grassy field on Honolulu Community College property, 66.0 m east of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 3.0 m by 9.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a water line 6.1 m southwest. An electric line was encountered 0.47 mbs in the south wall of the excavation.

A review of amplitude slice maps indicated no linear features although an electric line was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 164).

GPR depth profiles for T-069 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 165). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.1 mbs. No utilities were observed in the profile although an electric line was encountered during excavation. The maximum depth of clean signal return was approximately 0.9 mbs.

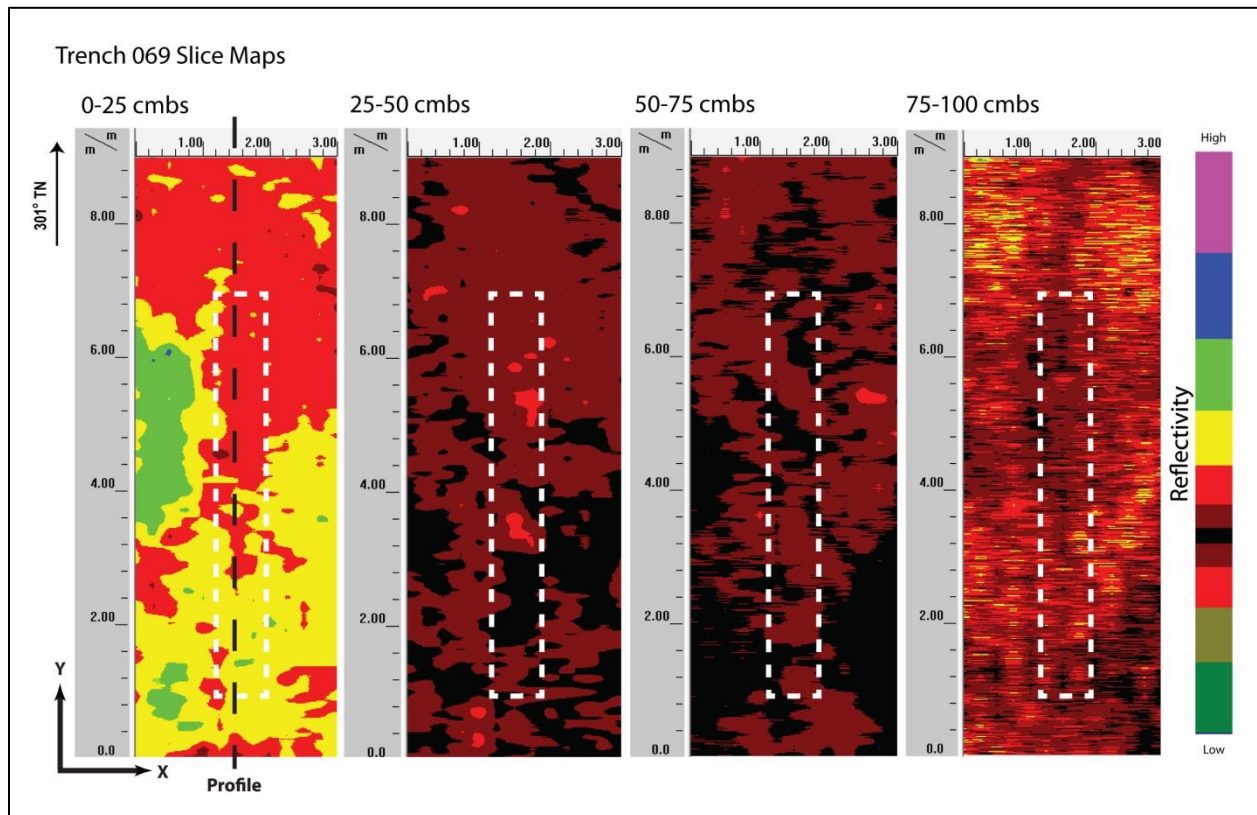


Figure 164. Slice maps of T-069 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 165). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was very gravelly sand. All other sediment transitions occurred below the maximum depth of clean signal return. An electrical line was found 0.47 mbs. The line did not show up on the profile or slice maps. This may be due to the fact the line was very small or comprised of PVC. No other discrete objects were observed in the GPR results.

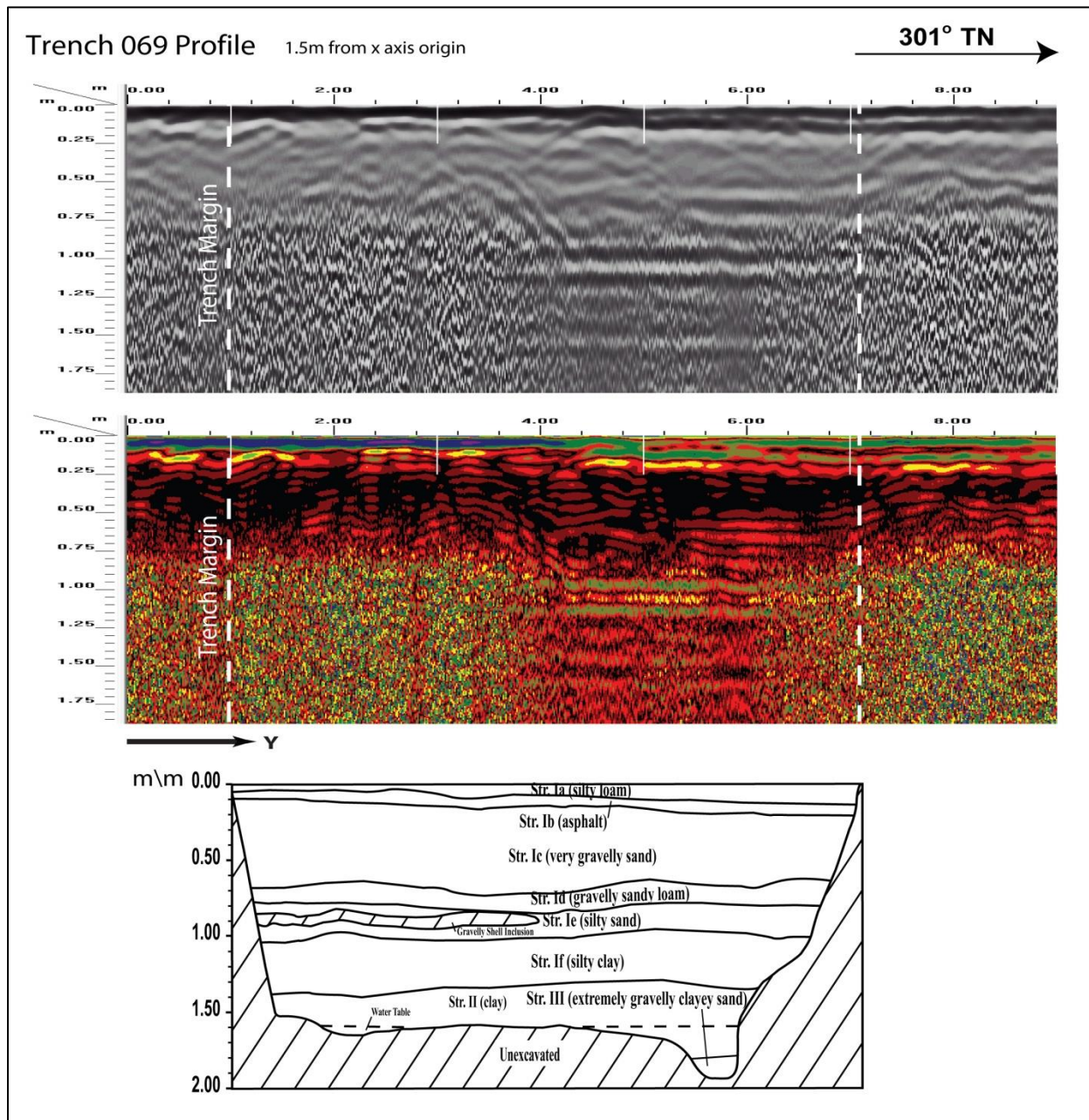


Figure 165. Visual comparison of excavated profile and GPR signal profile of T-069

Test Excavation 70

T-070 measured 0.9 m by 3.0 m and oriented northwest to southeast and was located on a sidewalk 70 m southwest of Dillingham Boulevard and Kokea Street intersection, 2.0 m south of Dillingham Boulevard. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: drain line 2.8 m northeast and an electrical line 3.4 m northeast. A utility pipe was encountered approximately 0.25 mbs in the center and within east wall of excavation.

A review of amplitude slice maps indicated a linear feature which corresponded to the utility pipe that was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 166).

GPR depth profiles for T-070 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 167). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. An anomaly was observed in the profile and corresponded to the utility that was encountered during excavation. The maximum depth of clean signal return was approximately 0.75 mbs.

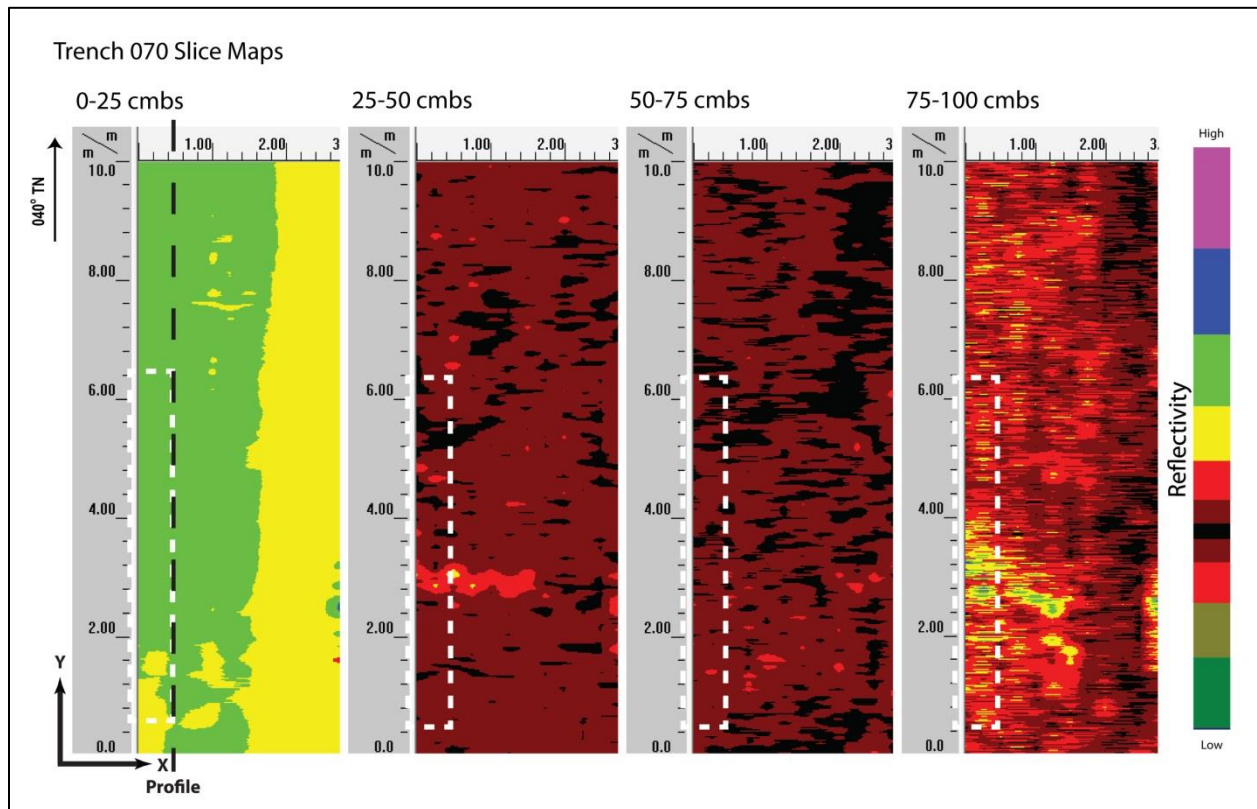


Figure 166. Slice maps of T-070 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 167). Strata Ia to Ib were all clearly observed and occurred near the ground-truthed depths. An increase in reflectivity was observed around 0.25 mbs and a hyperbola was also observed which corresponded to a drain pipe that was found during excavation. All other sediment transitions occurred below the maximum depth of clean signal return. No other discrete objects were observed in the GPR results or subsequent excavation.

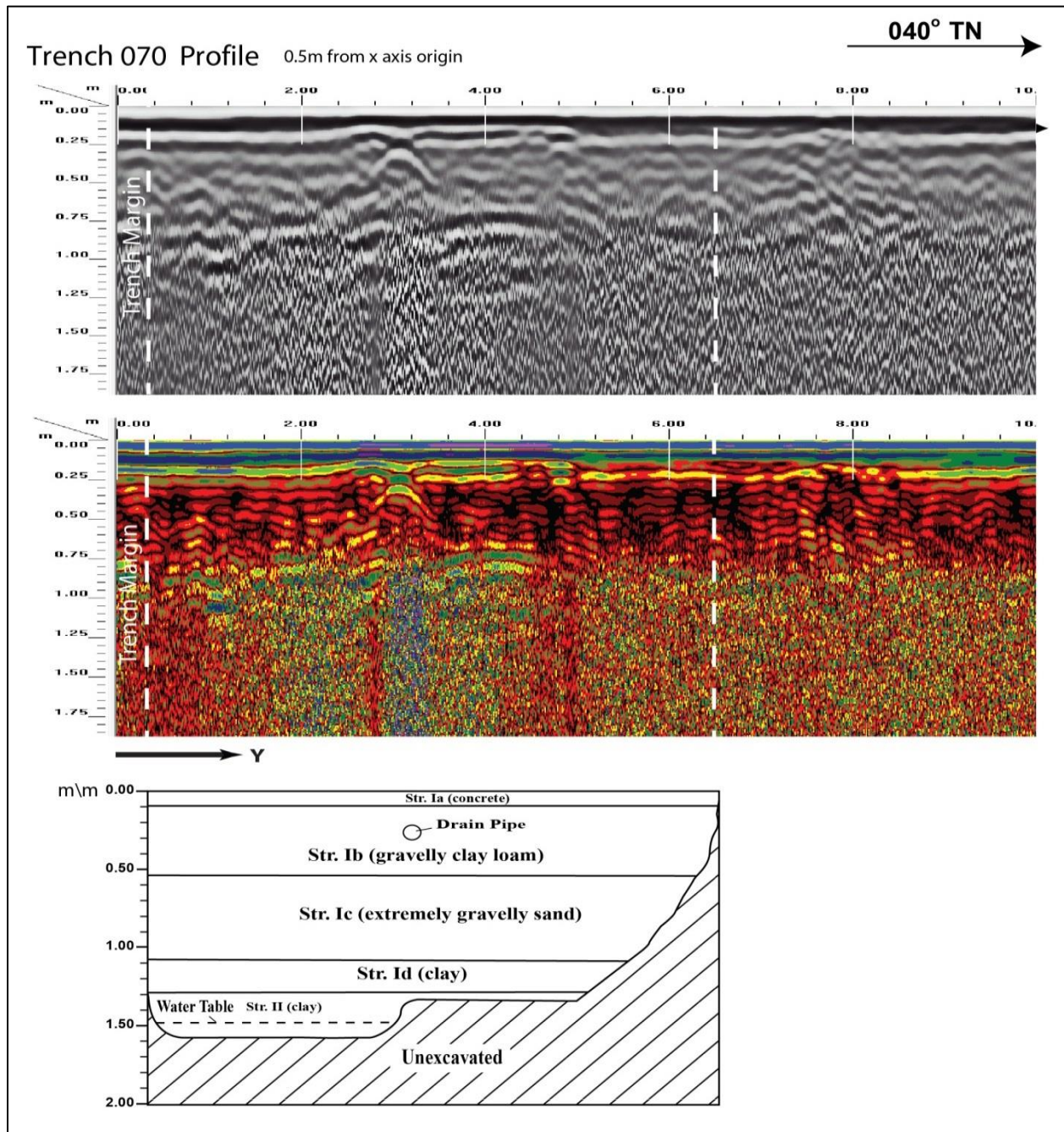


Figure 167. Visual comparison of excavated profile and GPR signal profile of T-070

Test Excavation 71

T-071 measured 0.9 m by 3.0 m and was oriented northeast to southwest and was located 85.0 m southeast of Dillingham Boulevard and Kokea Street intersection, within a parking lot south of Dillingham Boulevard. The GPR grid measured 3.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: electrical line 1.9 m northeast, sewer line 3.8 m northwest. A PVC utility pipe was encountered approximately 0.55 mbs in the northeast end of the excavation.

A review of amplitude slice maps indicated no linear features although utilities were encountered during excavation. Reflectivity was relatively uniform throughout the grid. A transition from higher reflectivity to lower reflectivity was not observable due to a low depth for the clean signal return (Figure 168).

GPR depth profiles for T-071 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 169). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.1 mbs. No utilities were observed in the profile however abandoned utilities were revealed in the excavation. The maximum depth of clean signal return was approximately 0.5 mbs.

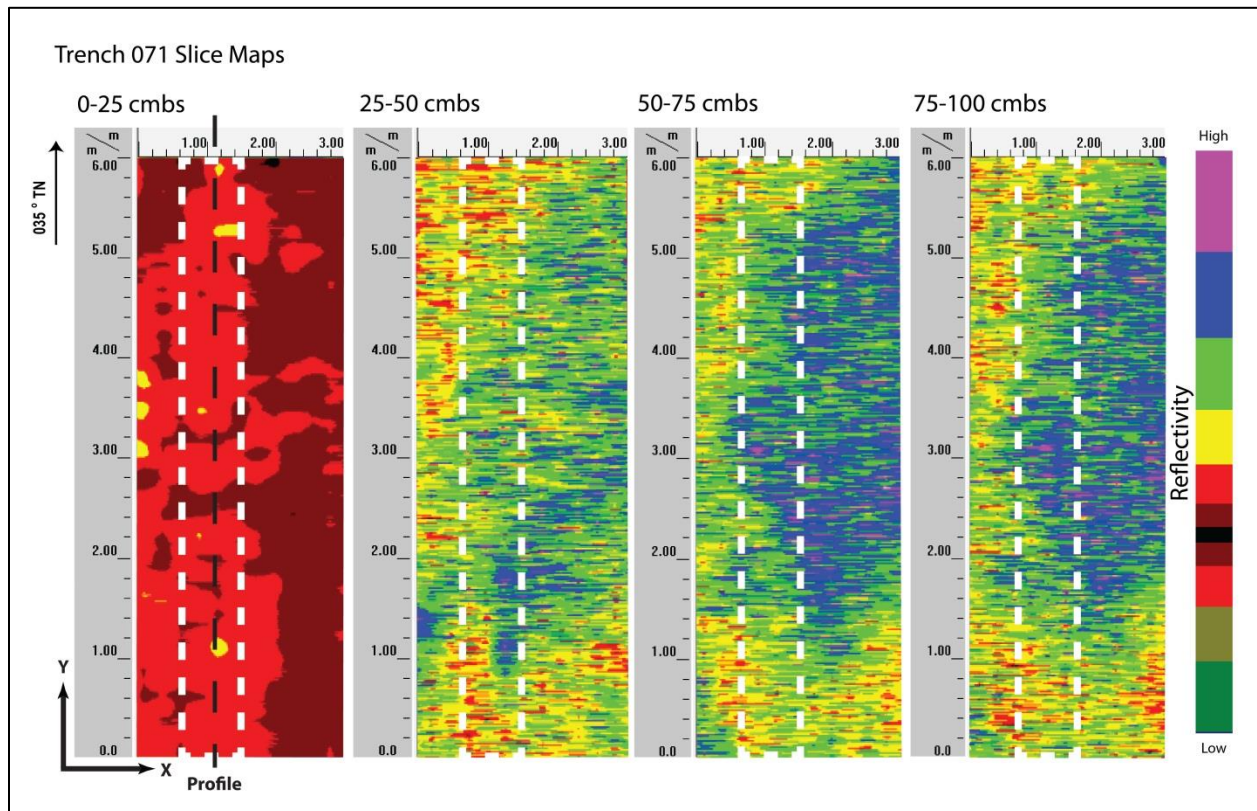


Figure 168. Slice maps of T-071 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 169). Strata included a thin layer of asphalt on top of multiple thin layers of fill down to 0.5 mbs. These transitions were not clearly depicted in the GPR profile. A PVC pipe was found 0.55 mbs. This pipe did not show up on the profile or slice maps. This pipe and all other sediment transitions were below the maximum clean signal return depth. No other discrete objects were observed in the GPR results or subsequent excavation.

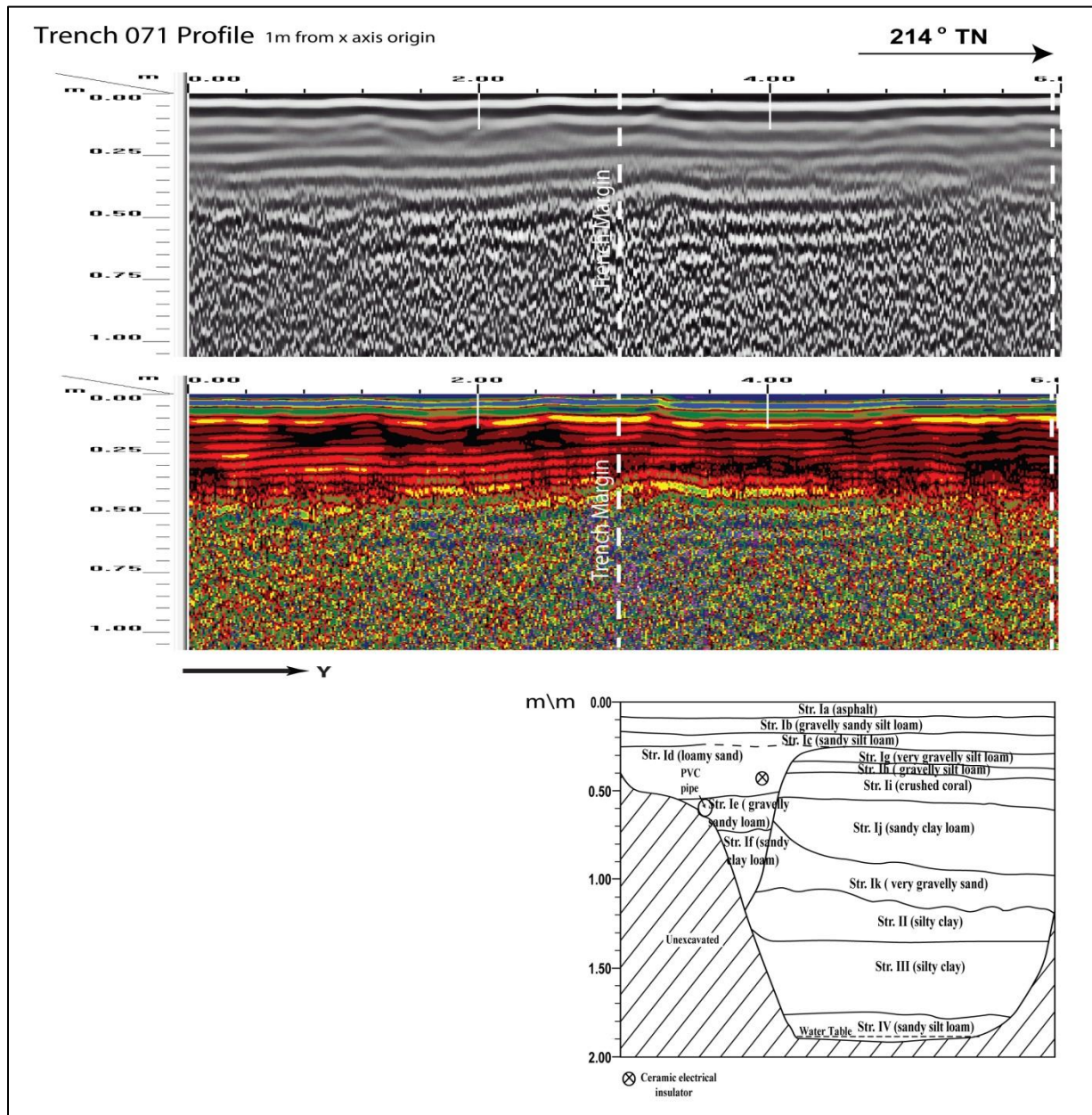


Figure 169. Visual comparison of excavated profile and GPR signal profile of T-071

Test Excavation 72

T-072 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard, 106.0 m southeast of Dillingham Boulevard and Kokea Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: drainage line 2.0 m southwest, water line 2.9 m northeast, and a sewer 6.8 m northeast. A utility jacket was encountered 0.66 mbs in the northeast wall of the excavation.

A review of amplitude slice maps indicated no linear features although a utility jacket was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 170).

GPR depth profiles for T-072 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 171). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. No utilities were observed in the profile although a utility jacket was encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

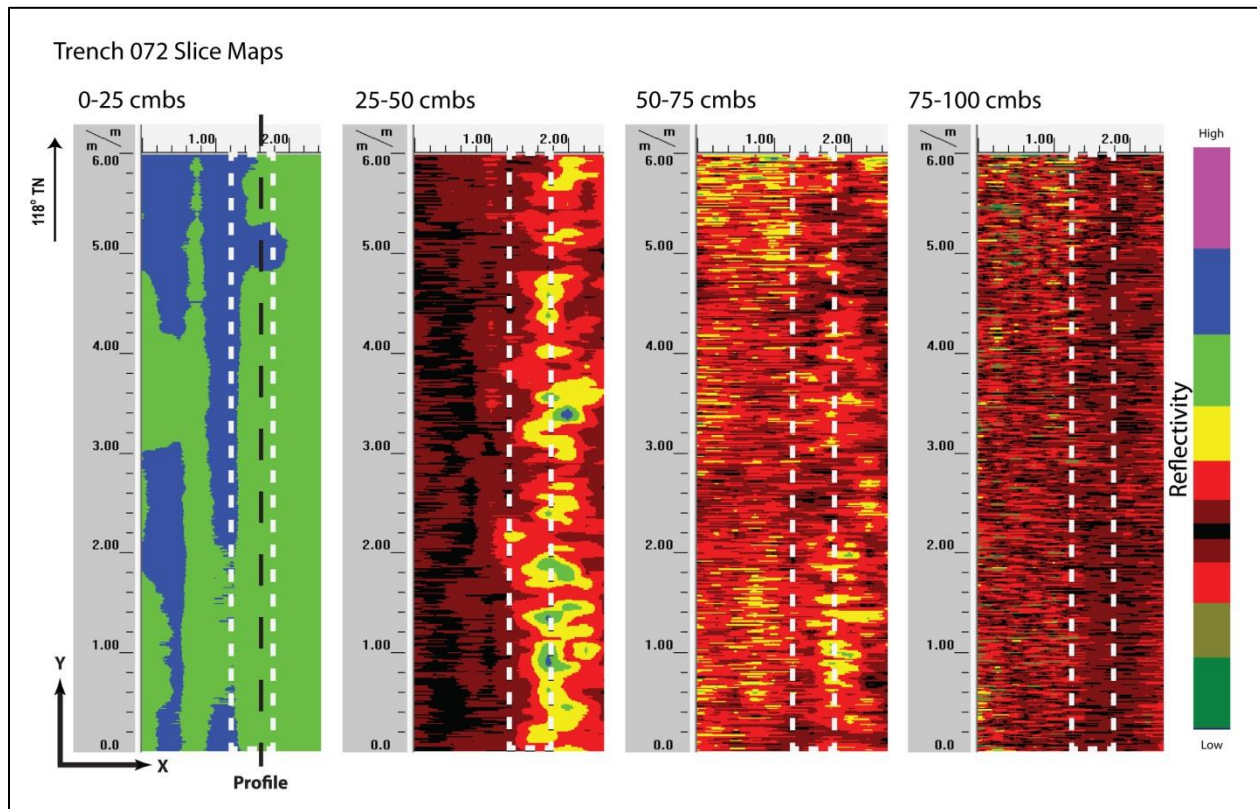


Figure 170. Slice maps of T-072 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 171). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was very gravelly sand fill. A utility jacket was found 0.66 mbs. The utility jacket was not clearly depicted in the GPR profile. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

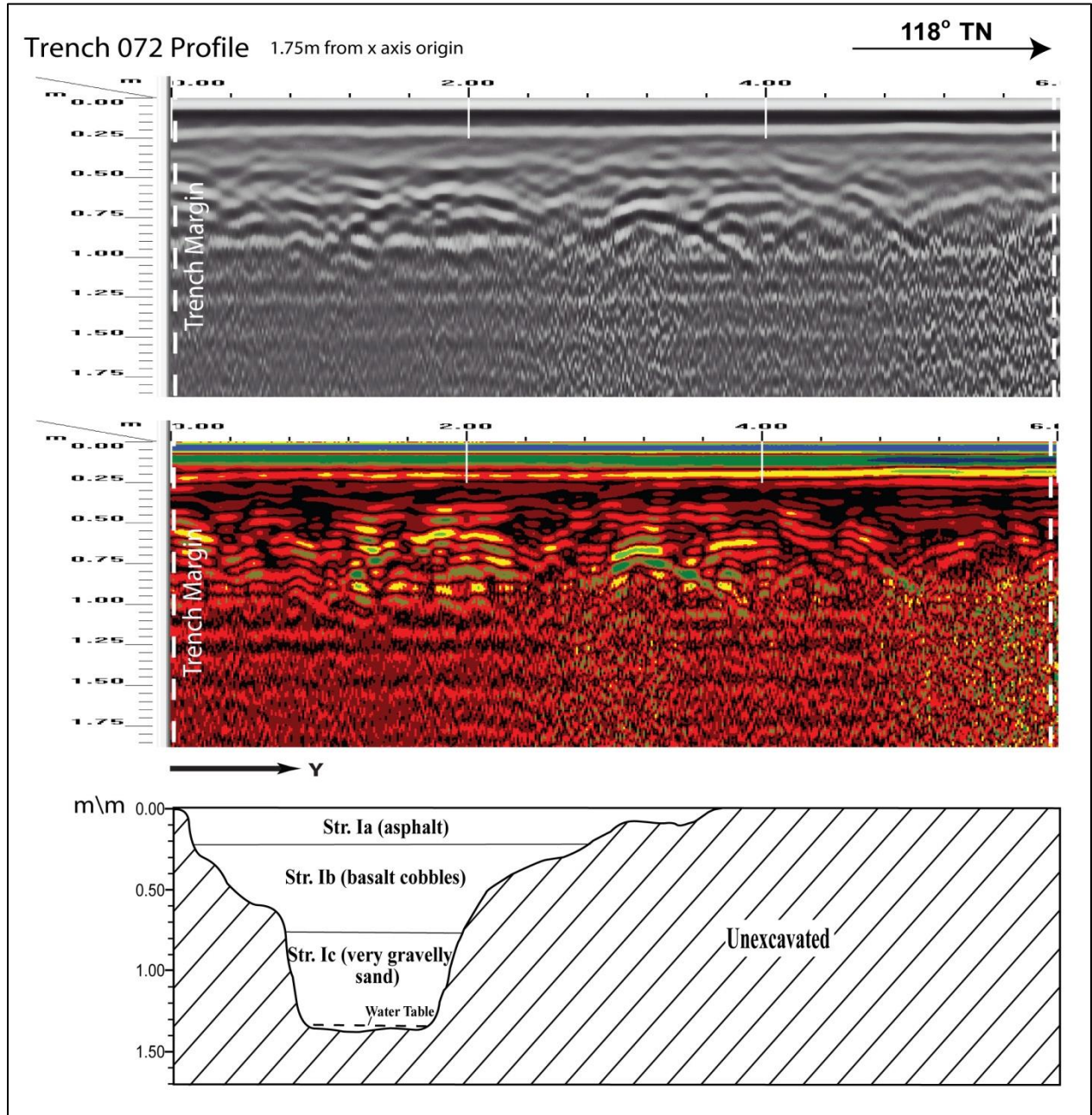


Figure 171. Visual comparison of excavated profile and GPR signal profile of T-072

Test Excavation 73

T-073 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard, 155.0 m northwest of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 2.0 m northeast and a sewer line 4.8 m northwest. A water line was encountered approximately 0.54 mbs in the eastern end of the excavation.

A review of amplitude slice maps indicated no linear features although a water line was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 172).

GPR depth profiles for T-073 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 173). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. An anomaly was observed in the profile and corresponded to the water line encountered during excavation. The maximum depth of clean signal return was approximately 0.85 mbs.

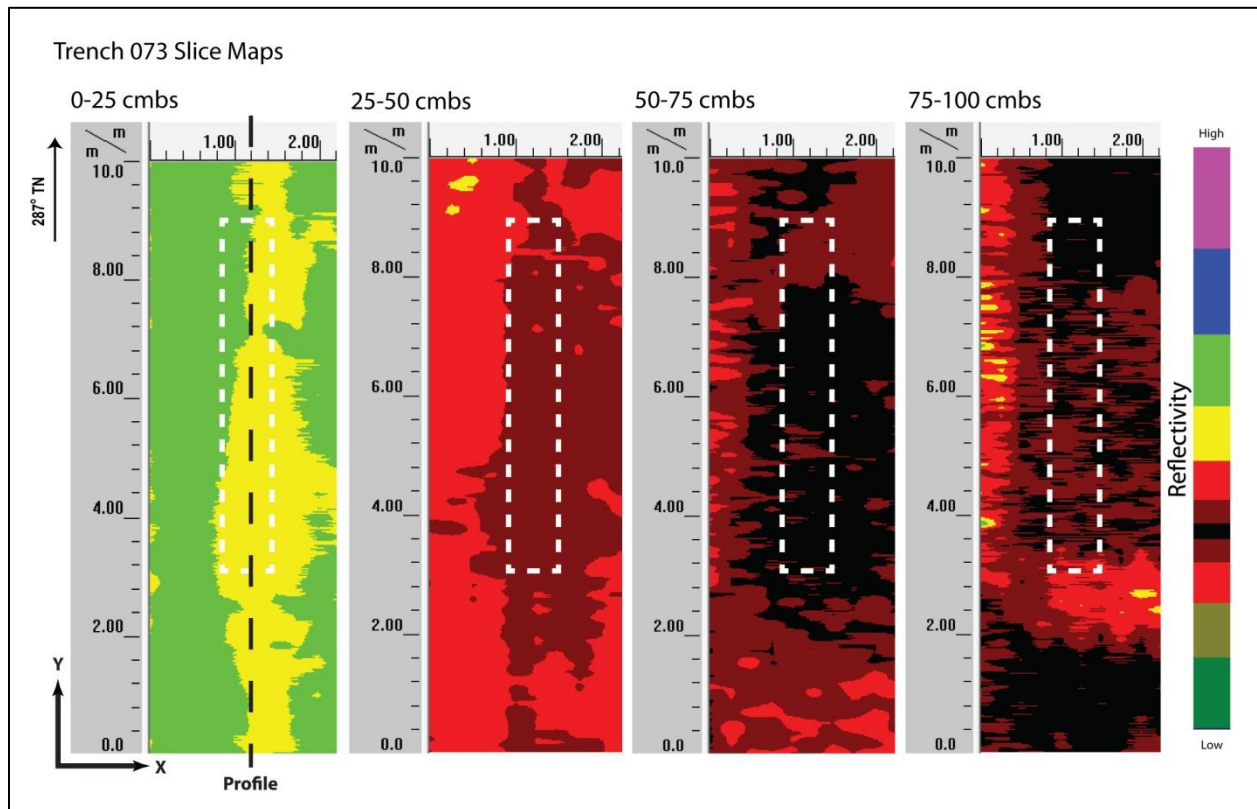


Figure 172. Slice maps of T-073 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 173). Strata included: asphalt, extremely cobbly silty sand, stony loamy clay, extremely gravelly sandy clay, gravelly sand, and clay. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. A copper pipe was found 0.54 mbs. This pipe corresponded to a void observed in the profile. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

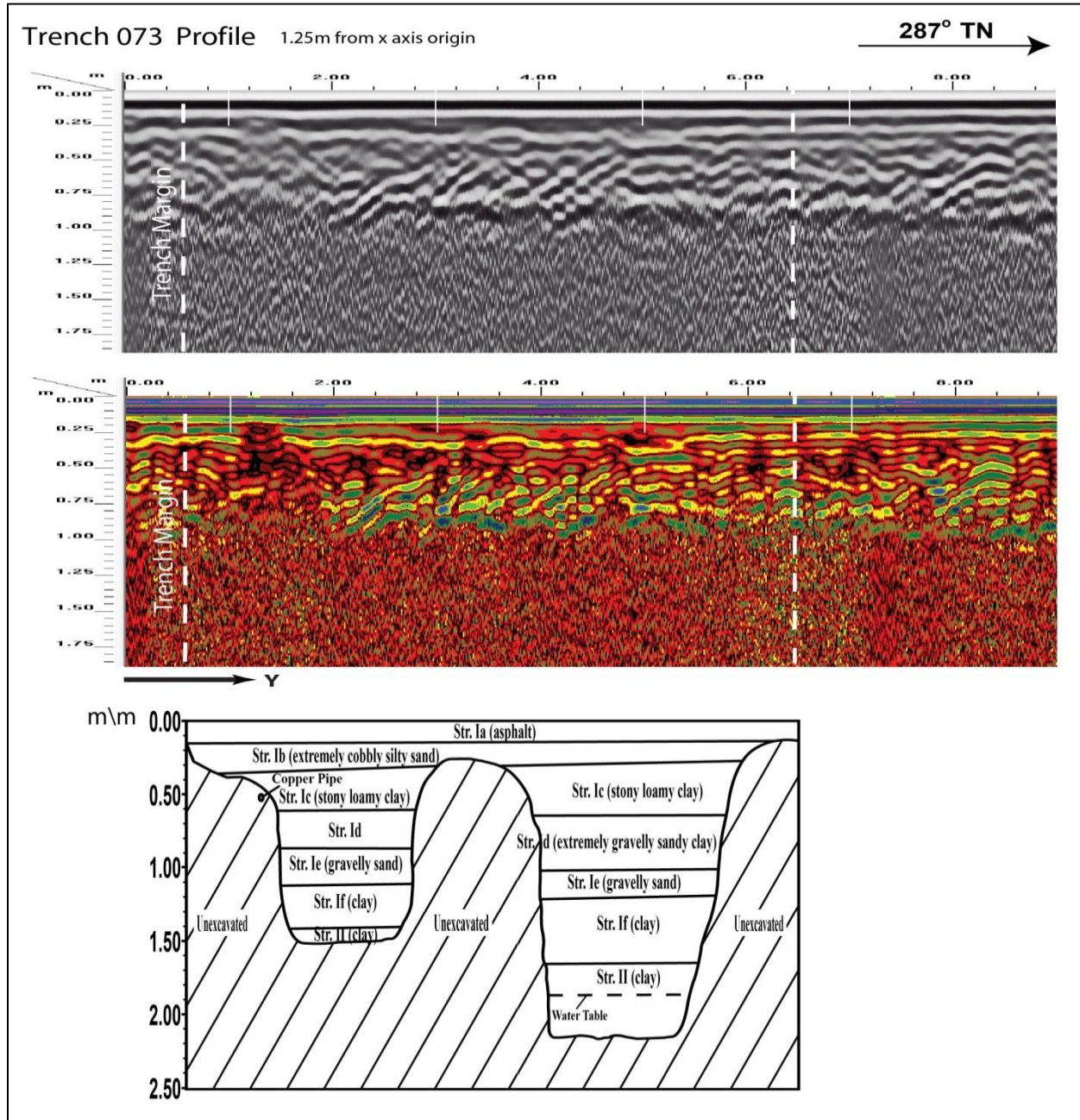


Figure 173. Visual comparison of excavated profile and GPR signal profile of T-073

Test Excavation 74

T-074 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane, 100.0 m northwest of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 3.7 m northeast and a sewer line 3.4 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but was not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the linear feature. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 174).

GPR depth profiles for T-074 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 175). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.7 mbs.

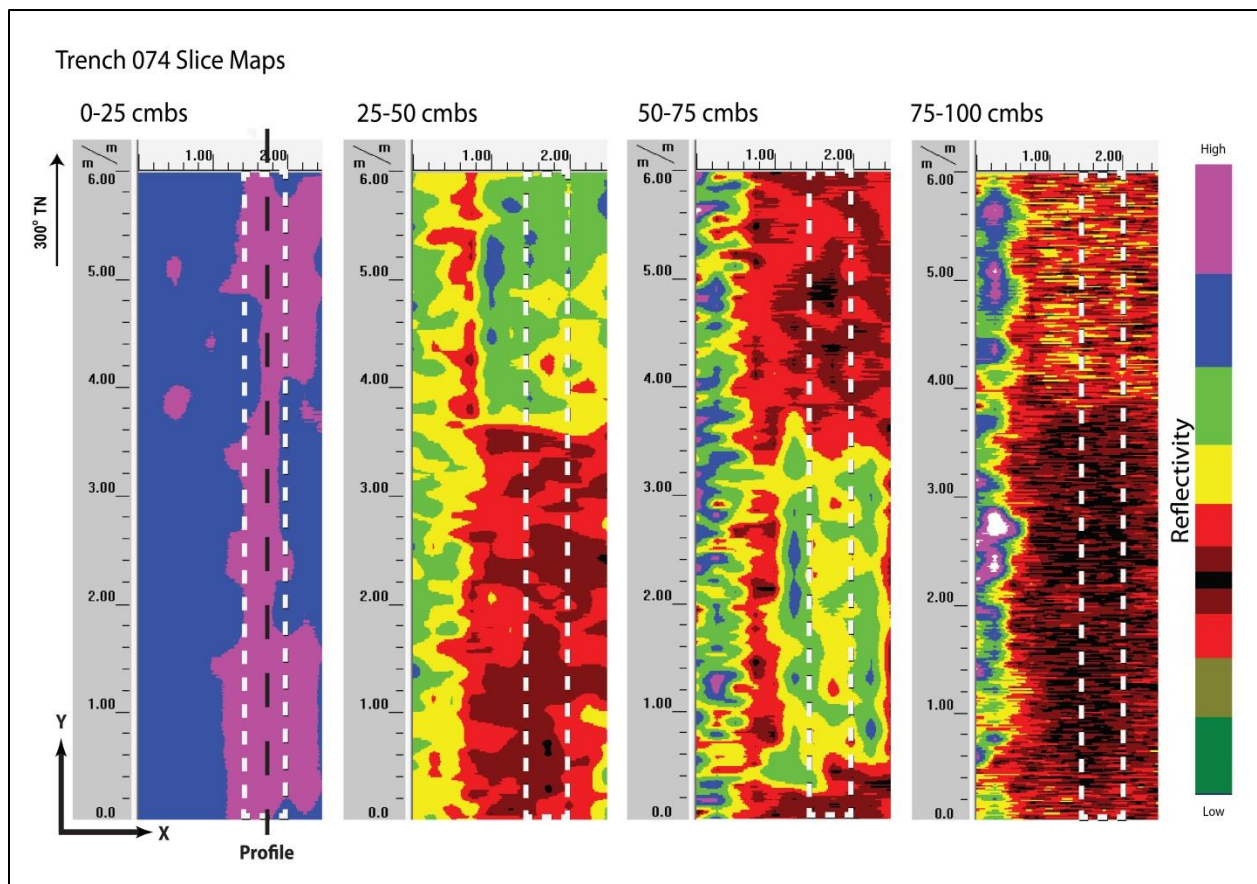


Figure 174. Slice maps of T-074 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 175). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Strata included a layer of asphalt on top of basalt gravel followed by slightly gravelly sandy clay that continued down to 2.0 mbs. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

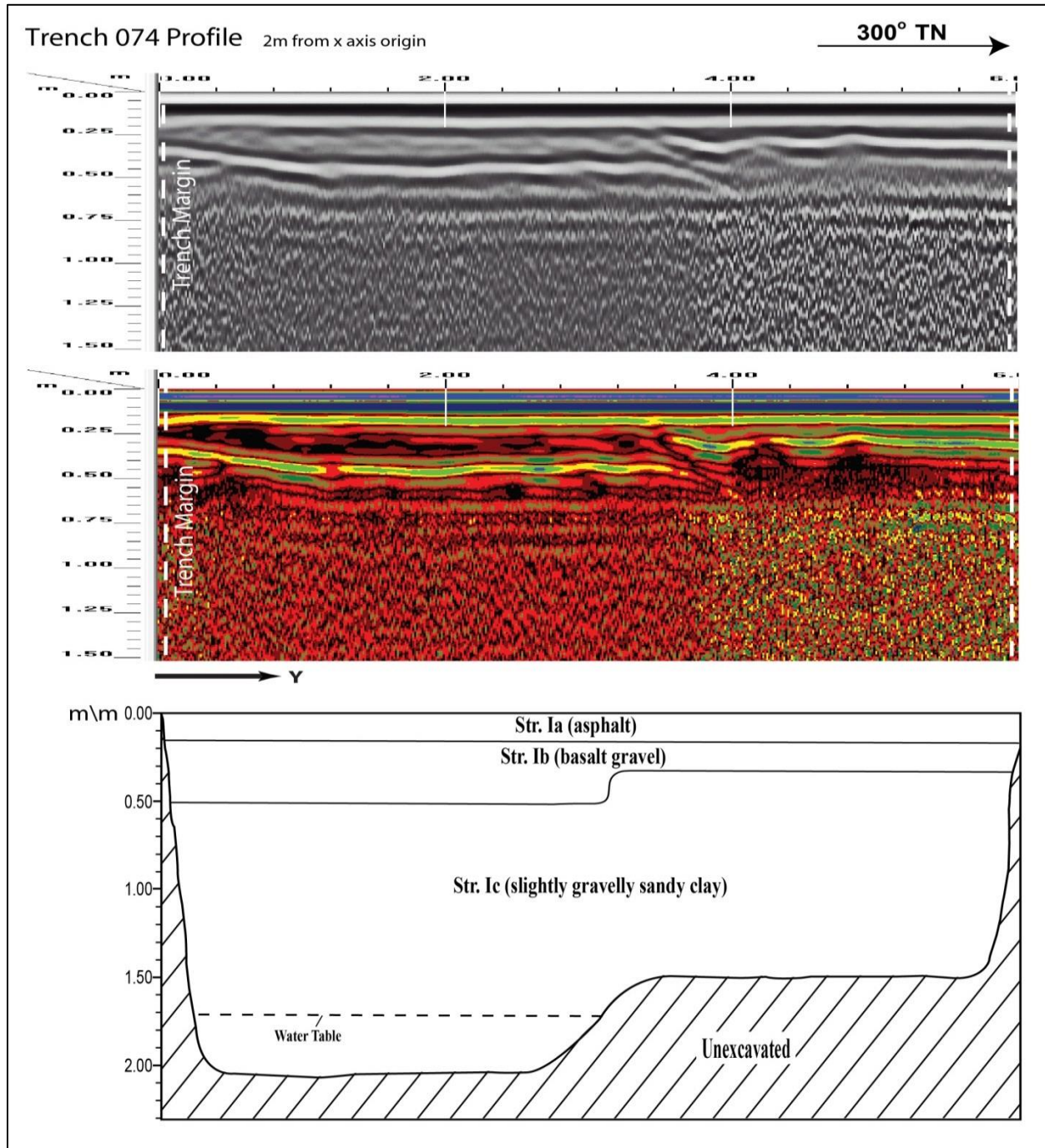


Figure 175. Visual comparison of excavated profile and GPR signal profile of T-074

Test Excavation 75

T-075 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane, 58.0 m northwest of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: electric line 1.9 m northeast and a water line 2.6 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 176).

GPR depth profiles for T-075 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 177). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.75 mbs.

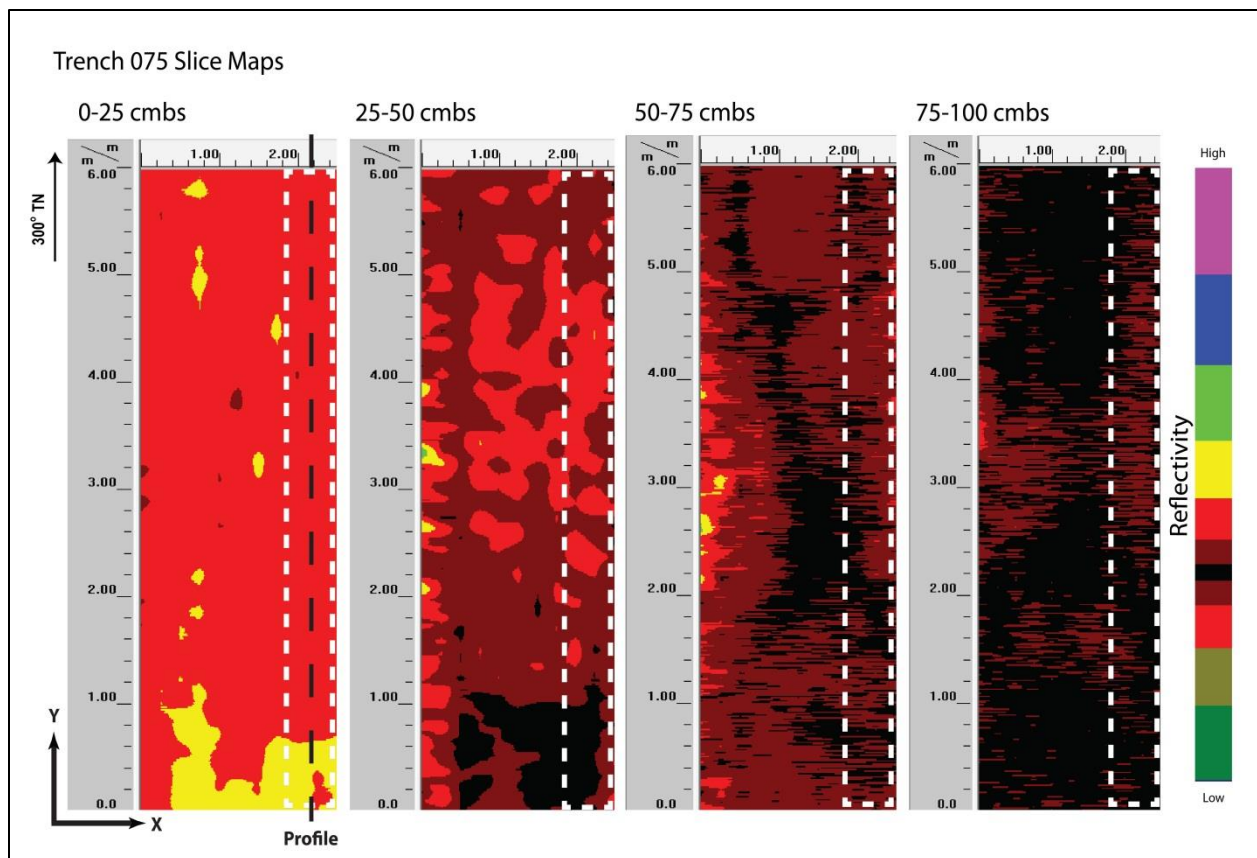


Figure 176. Slice maps of T-075 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 177). Strata Ia and Ib were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ib which was a very gravelly to cobbly sandy loam. All other sediment transitions were below the maximum clean signal return depth. No discrete objects were observed in the GPR results or subsequent excavation.

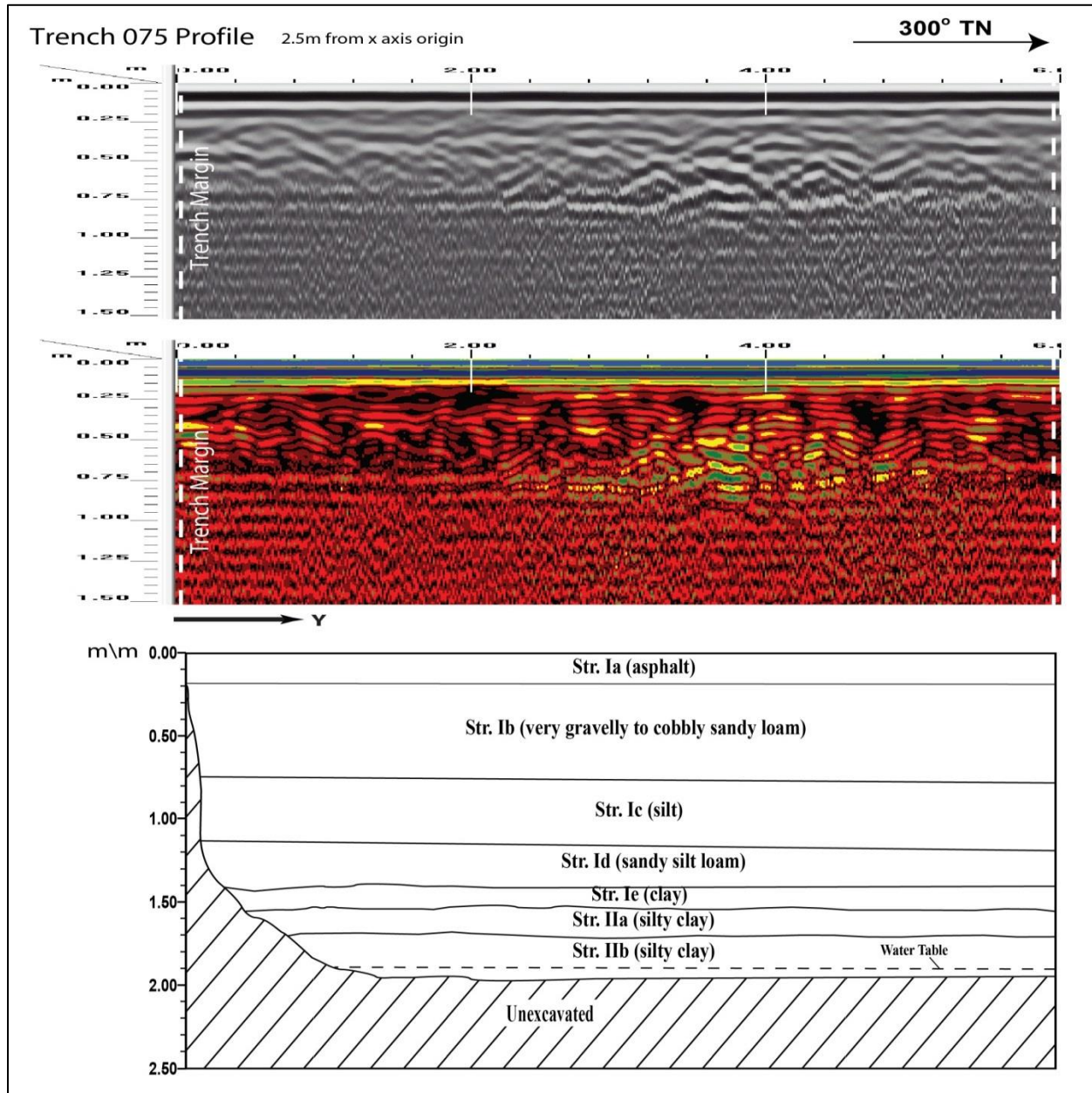


Figure 177. Visual comparison of excavated profile and GPR signal profile of T-075

Test Excavation 76

T-076 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard, 33.0 m northwest of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.5 m by 10 m with 0.25 m spacing between Y transects and 1 m transects between X transects. Utilities located near the excavation include: electrical line 2.6 m northeast, storm drain line 2.5 m southwest, and a sewer line 4.9 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 178).

GPR depth profiles for T-076 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 179). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs and again around 0.35 mbs. An anomaly was observed in the profile but was not within the excavation boundaries. The maximum depth of clean signal return was approximately 0.9 mbs.

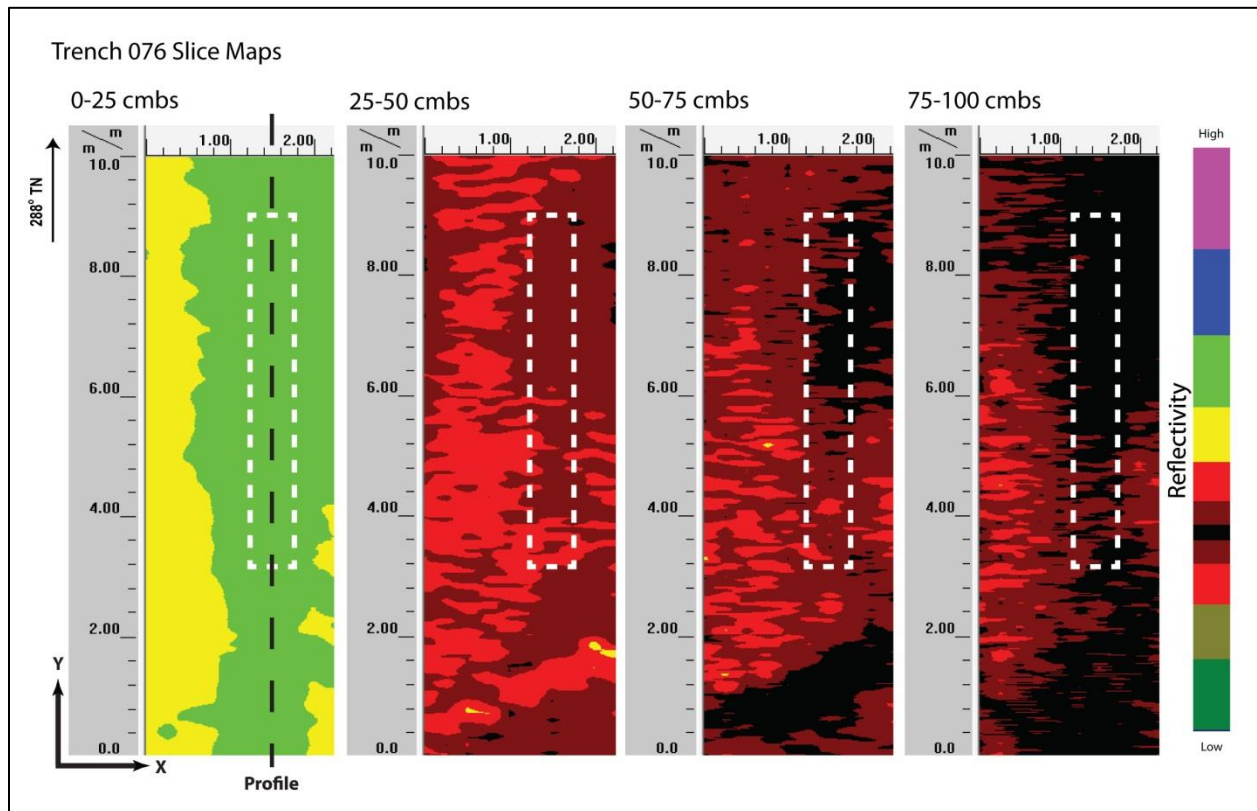


Figure 178. Slice maps of T-076 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 179). Strata Ia to Ic were all clearly observed and occurred at the ground-truthed depths. Strata include: asphalt, extremely gravelly loam, concrete and boulders, very gravelly sand, silty sandy loam, very gravelly sand, sandy loam, and two layers of clay. Strata Id through If were not clearly observed and do not occurred at the ground-truthed depths. All other sediment transitions were below the maximum clean signal return depth. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

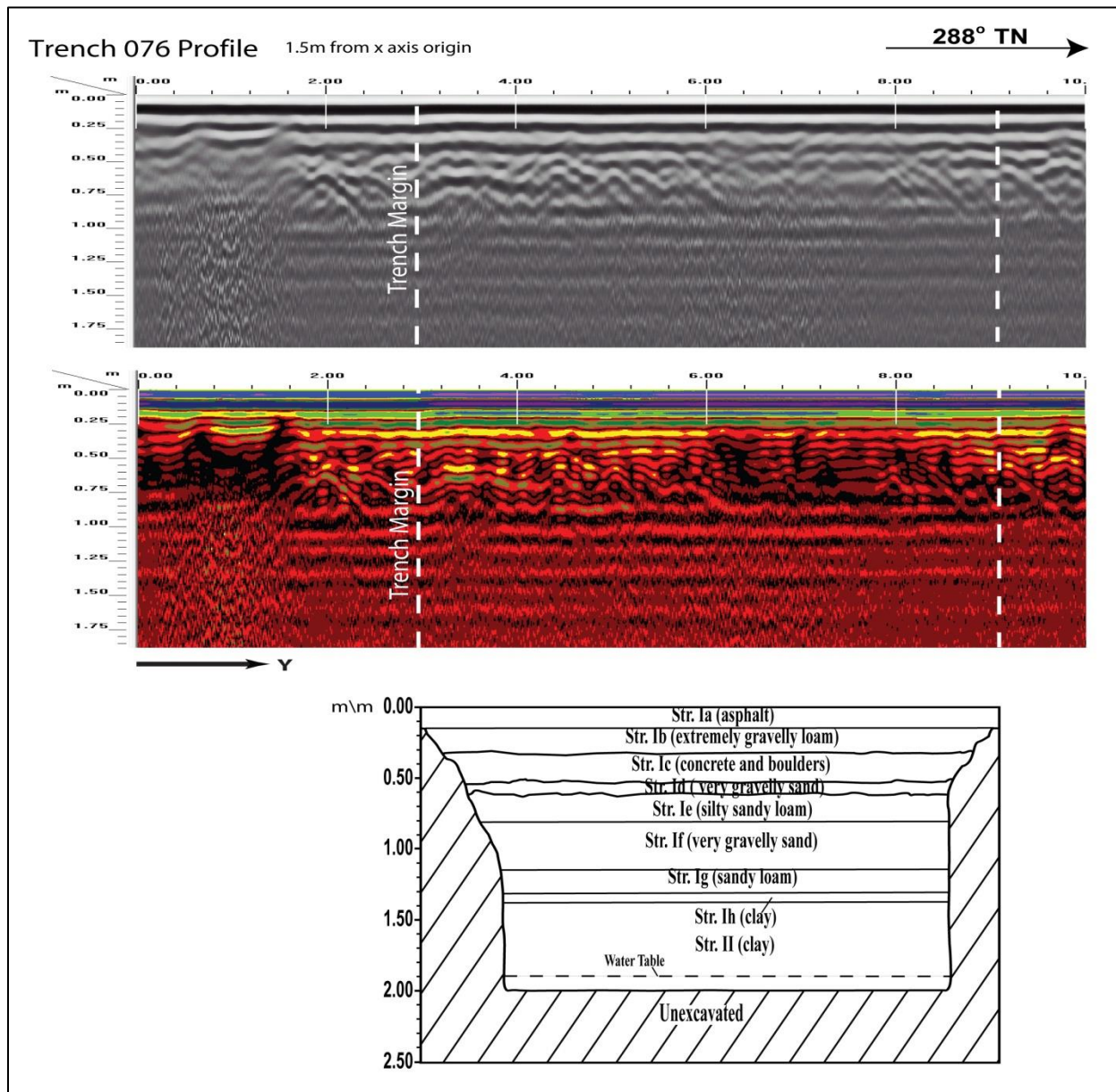


Figure 179. Visual comparison of excavated profile and GPR signal profile of T-076

Test Excavation 77

T-077 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane, 27.0 m east of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 1.1 m northeast and 5.4 m northeast, and a sewer line 3.4 m east.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 180).

GPR depth profiles for T-077 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 181). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 0.8 mbs.

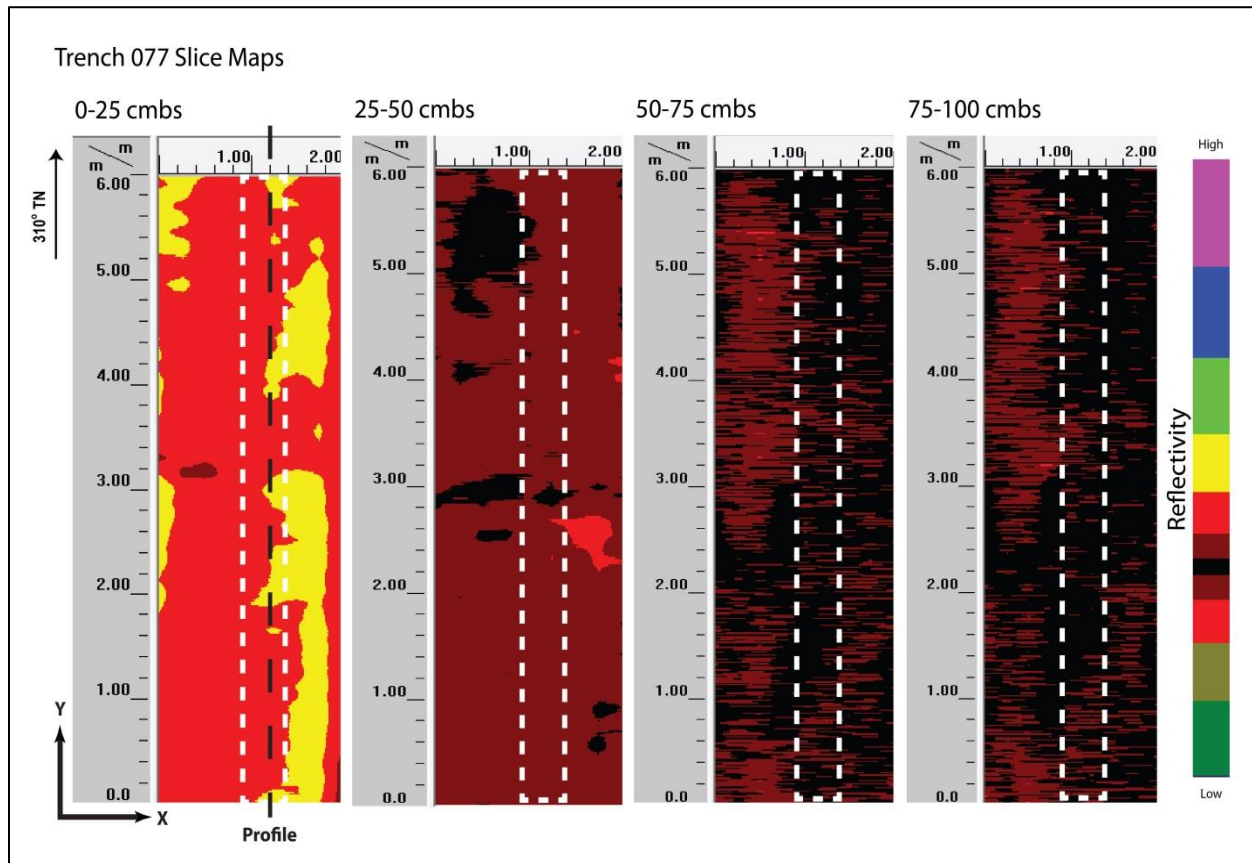


Figure 180. Slice maps of T-077 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 181). Strata Ia through Id were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Id which was very gravelly sand. All other sediment transitions were below the maximum clean signal return depth. No discrete objects were observed in the GPR results or subsequent excavation.

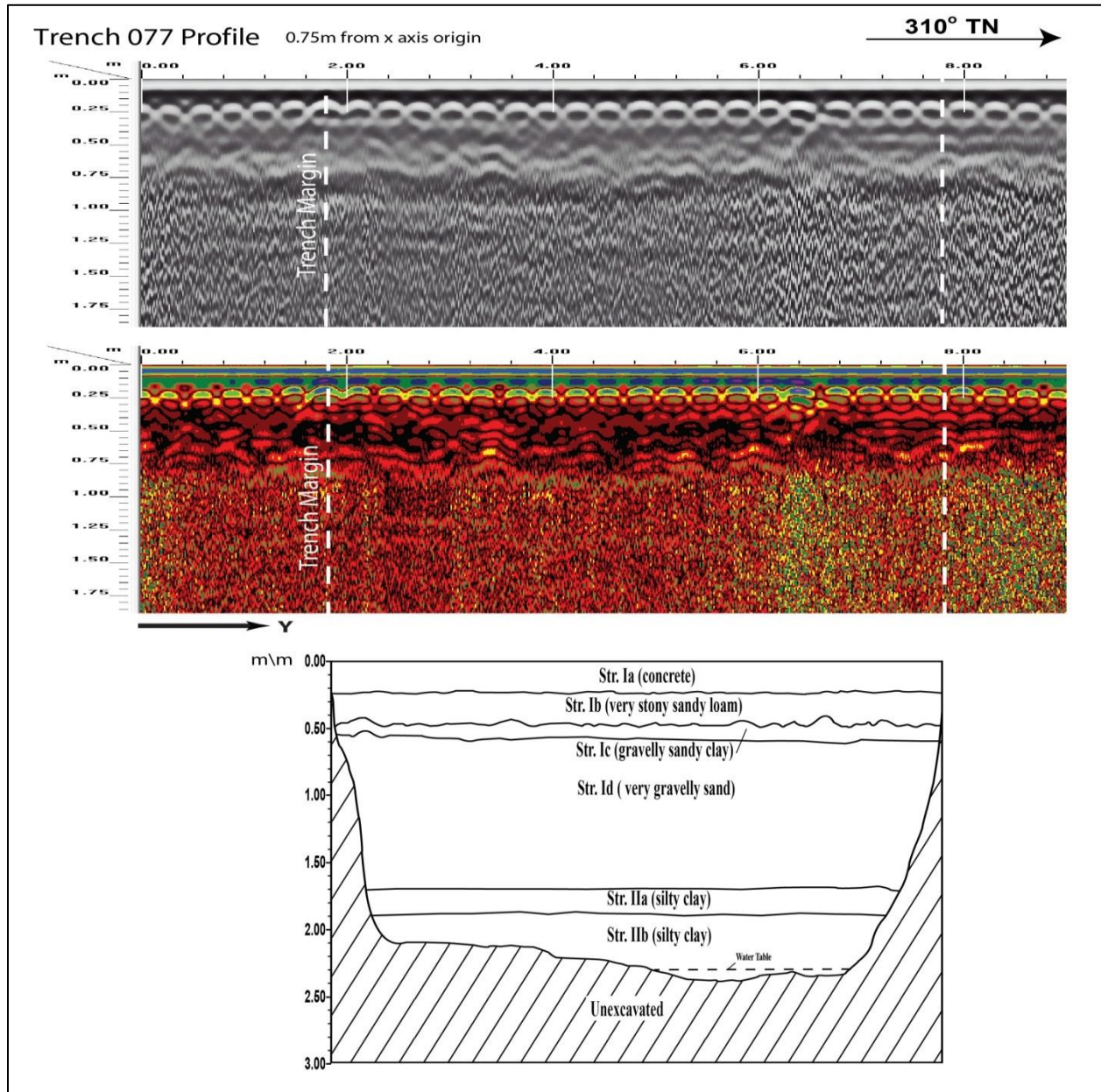


Figure 181. Visual comparison of excavated profile and GPR signal profile of T-077

Test Excavation 78

T-078 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the eastbound lane, 63.0 m southeast of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 2.5 m southwest, gas line 1.0 m southeast, and an electrical line 3.9 m northeast. A utility was encountered approximately 0.68 mbs in the southeast end of the excavation.

A review of amplitude slice maps indicated no linear features although a utility was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 182).

GPR depth profiles for T-078 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 183). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. An anomaly was observed in the profile that corresponded to a utility that was encountered during excavation. The maximum depth of clean signal return was approximately 0.75 mbs.

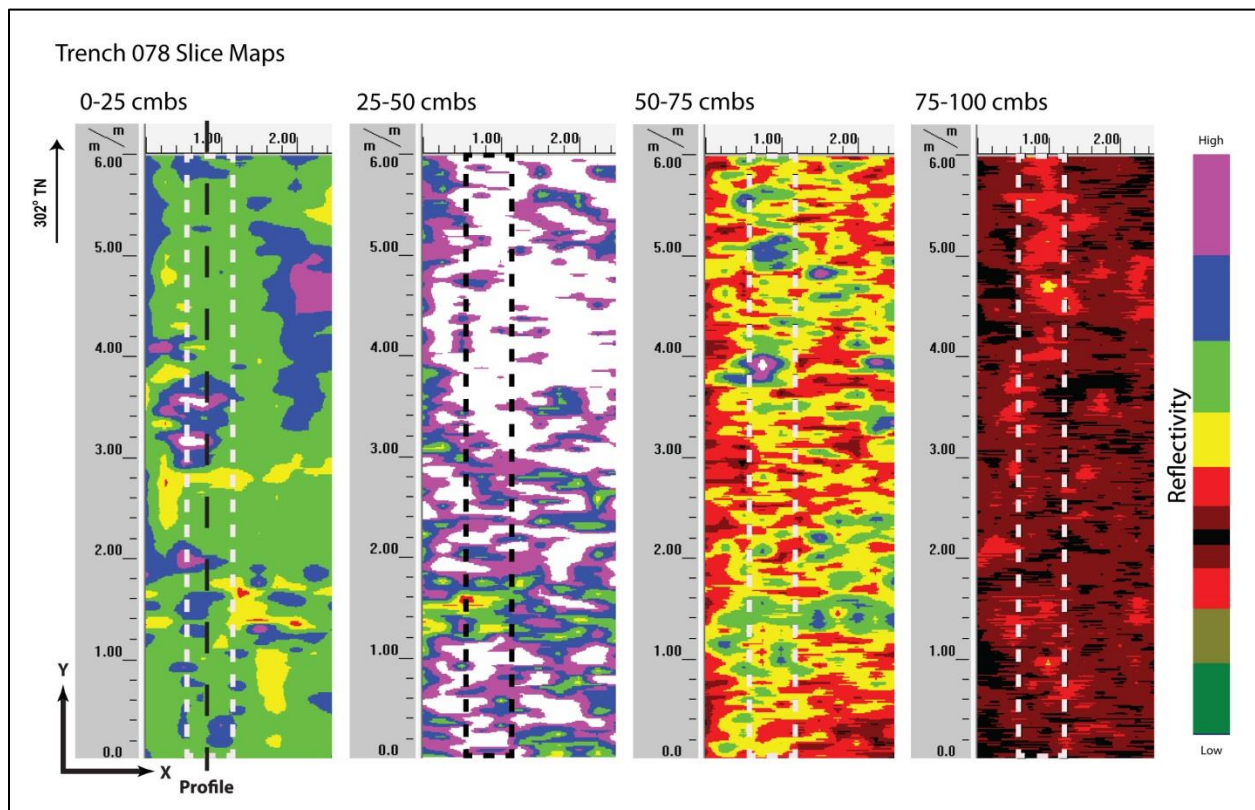


Figure 182. Slice maps of T-078 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 183). Strata Ia through Id were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in strata Ib and Id which were gravelly to cobbly silty sand and gravelly sand, respectively. A utility pipe was found 0.68 mbs. This pipe corresponded to an anomaly observed in the profile. All other sediment transitions were below the maximum clean signal return depth. No other discrete objects were observed in the GPR results.

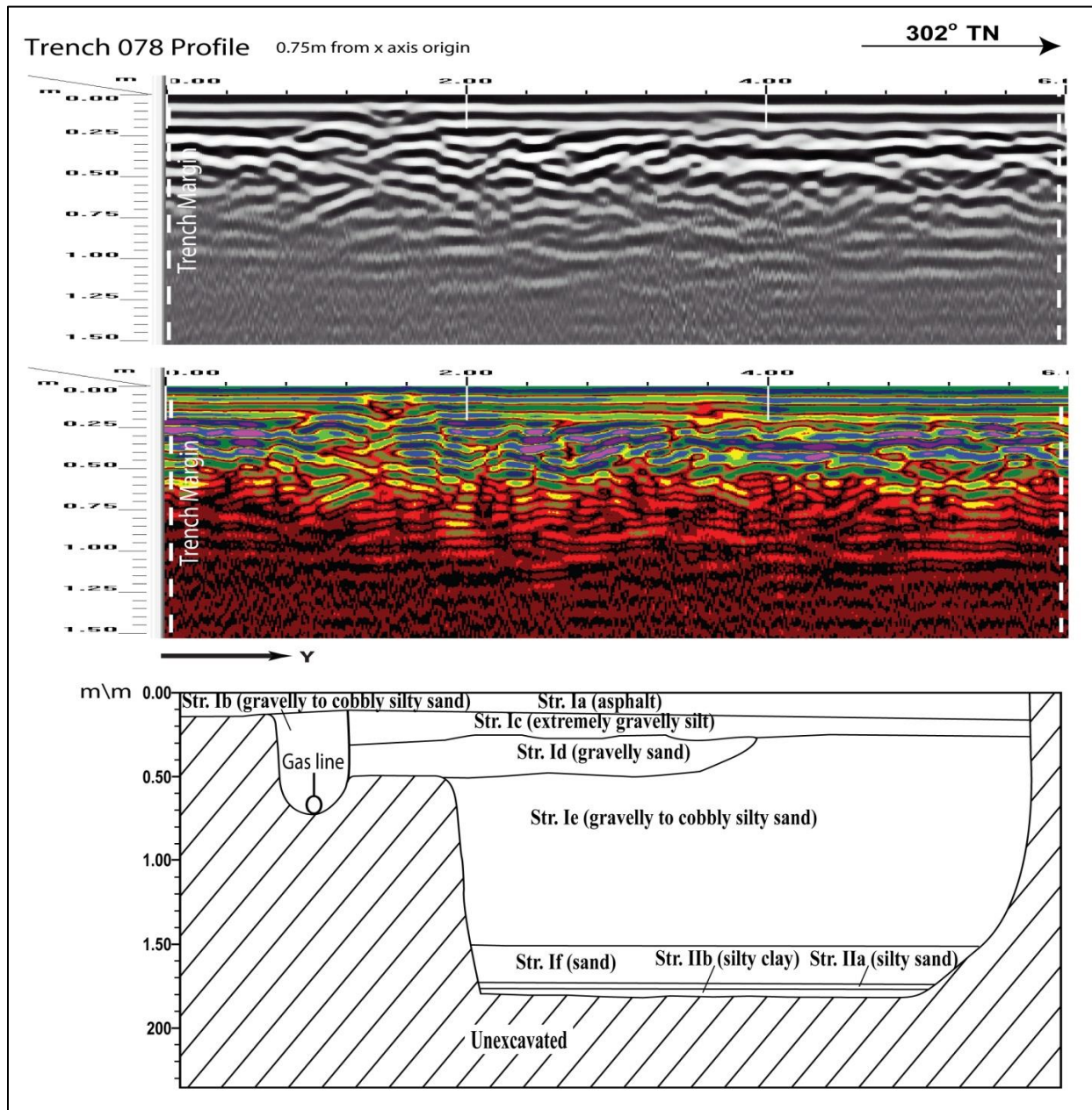


Figure 183. Visual comparison of excavated profile and GPR signal profile of T-078

Test Excavation 79

T-079 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the eastbound lane, 110.0 m southeast of Dillingham Boulevard and Alakawa Street intersection. The GRP grid measured 2.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 2.9 m southwest, electrical line 3.7 m northeast, and a sewer line 5.4 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but was not within excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.50 mbs and increases again around 0.75 mbs (Figure 184).

GPR depth profiles for T-079 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 185). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.6 mbs. An anomaly was observed in the profile but was not within excavation boundaries. The maximum depth of clean signal return was approximately 1.0 mbs.

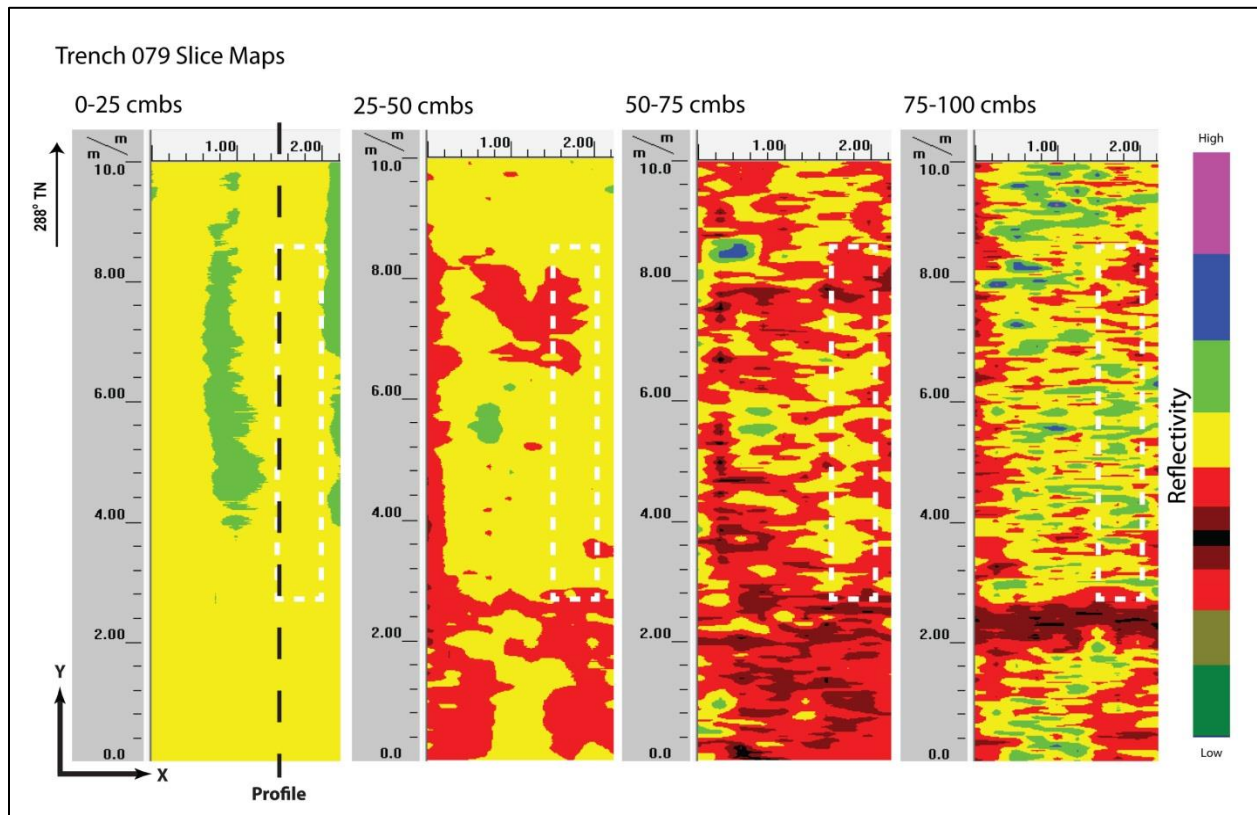


Figure 184. Slice maps of T-079 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 185). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was extremely stony sand. All other sediment transitions were below the maximum depth of clean signal return. No discrete objects were observed in the GPR results or subsequent excavation.

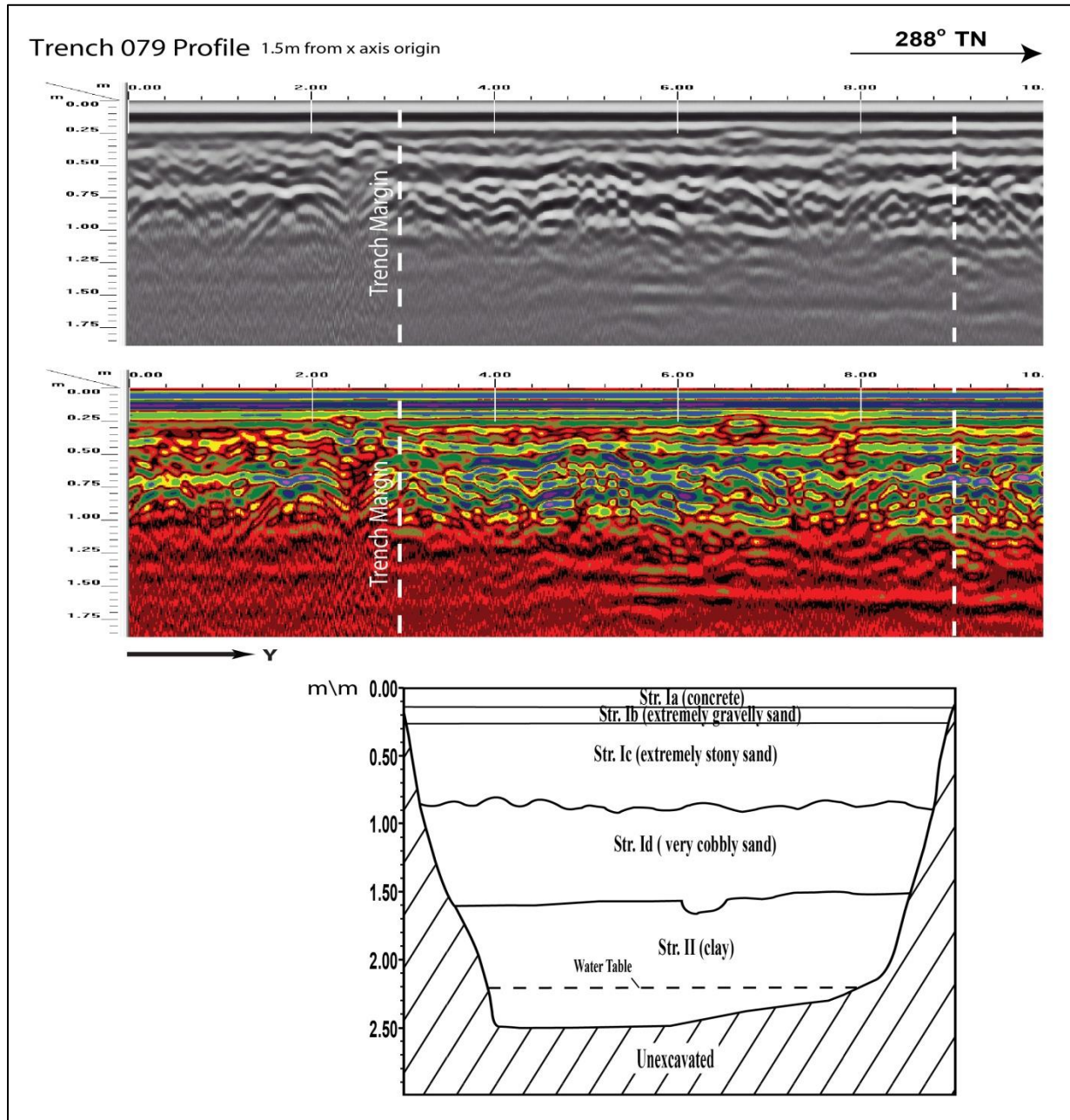


Figure 185. Visual comparison of excavated profile and GPR signal profile of T-079

Test Excavation 80

T-080 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the east bound lane, 130.0 m southeast of Dillingham Boulevard and Alakawa Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities included near the excavation include: storm drain 2.1 m southwest and an electrical line 4.8 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 186).

GPR depth profiles for T-080 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 187). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

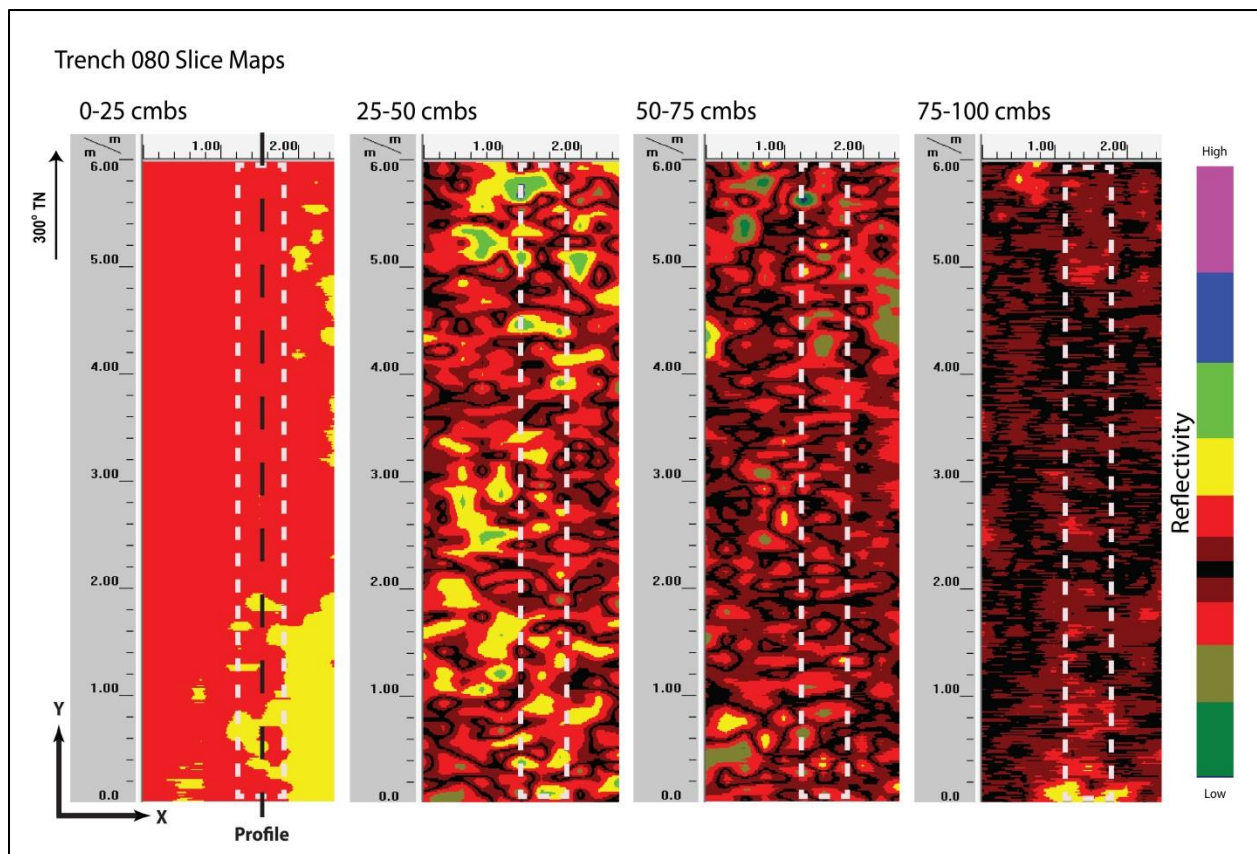


Figure 186. Slice maps of T-080 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 187). Strata Ia to Ic were all clearly observed and occurred near the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was very gravelly sand fill. Strata Id to II were not clearly observed and do not occurred at the ground-truthed depths. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

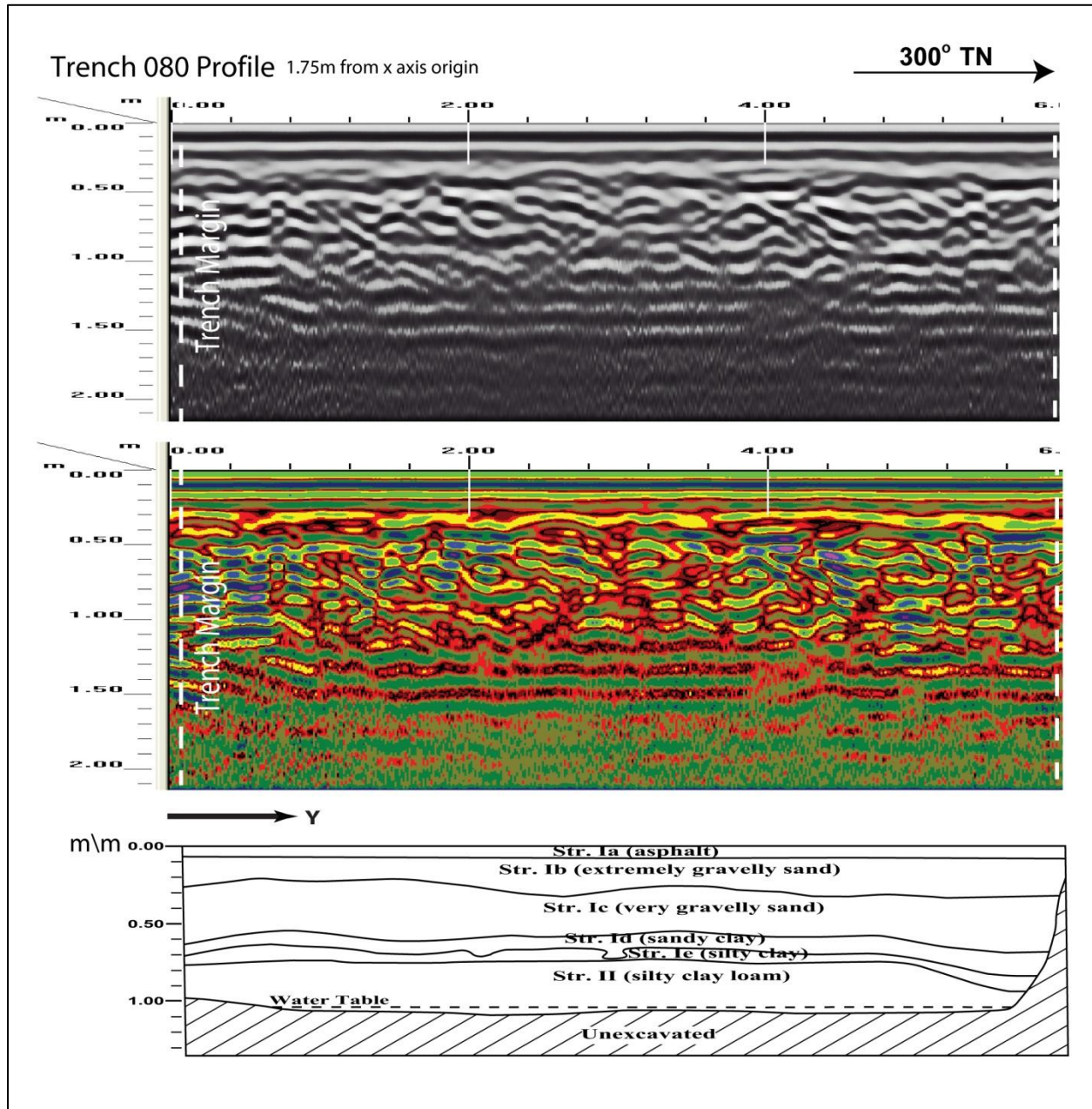


Figure 187. Visual comparison of excavated profile and GPR signal profile of T-080

Test Excavation 81

T-081 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the center median of Dillingham Boulevard, 115.0 m northwest of Dillingham Boulevard and Akepo Lane intersection. The GPR grid measured 3.0 m by 9.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities included near the excavation include: sewer line 1.4 m northeast, water line 3.1 m northeast, and an electrical line 4.8 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 188).

GPR depth profiles for T-081 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 189). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs and again around 0.5 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

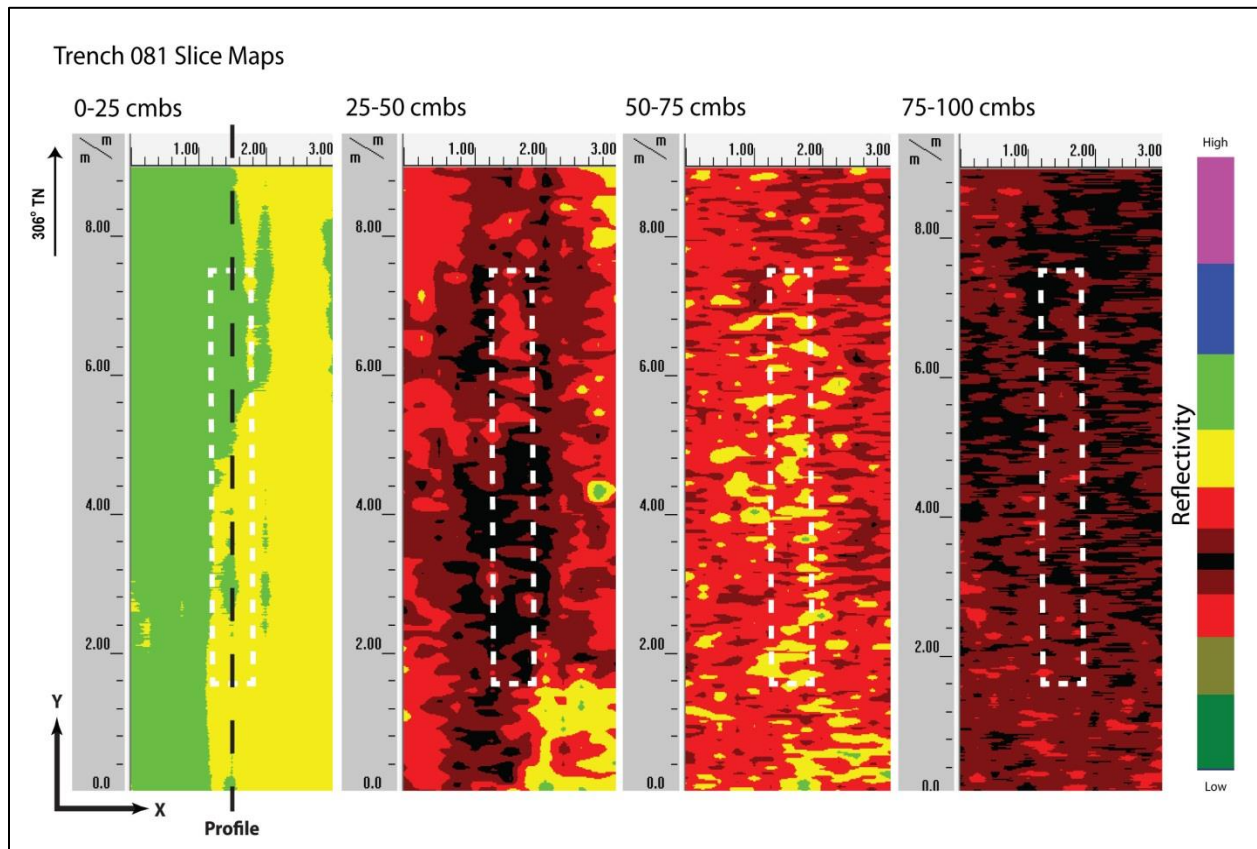


Figure 188. Slice maps of T-081 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 189). Strata Ia to Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas and an increase in reflectivity were apparent in Stratum Ib which was extremely stony silty sand. All other sediment transitions were below the maximum clean signal return depth. No discrete objects were observed in the GPR results or subsequent excavation.

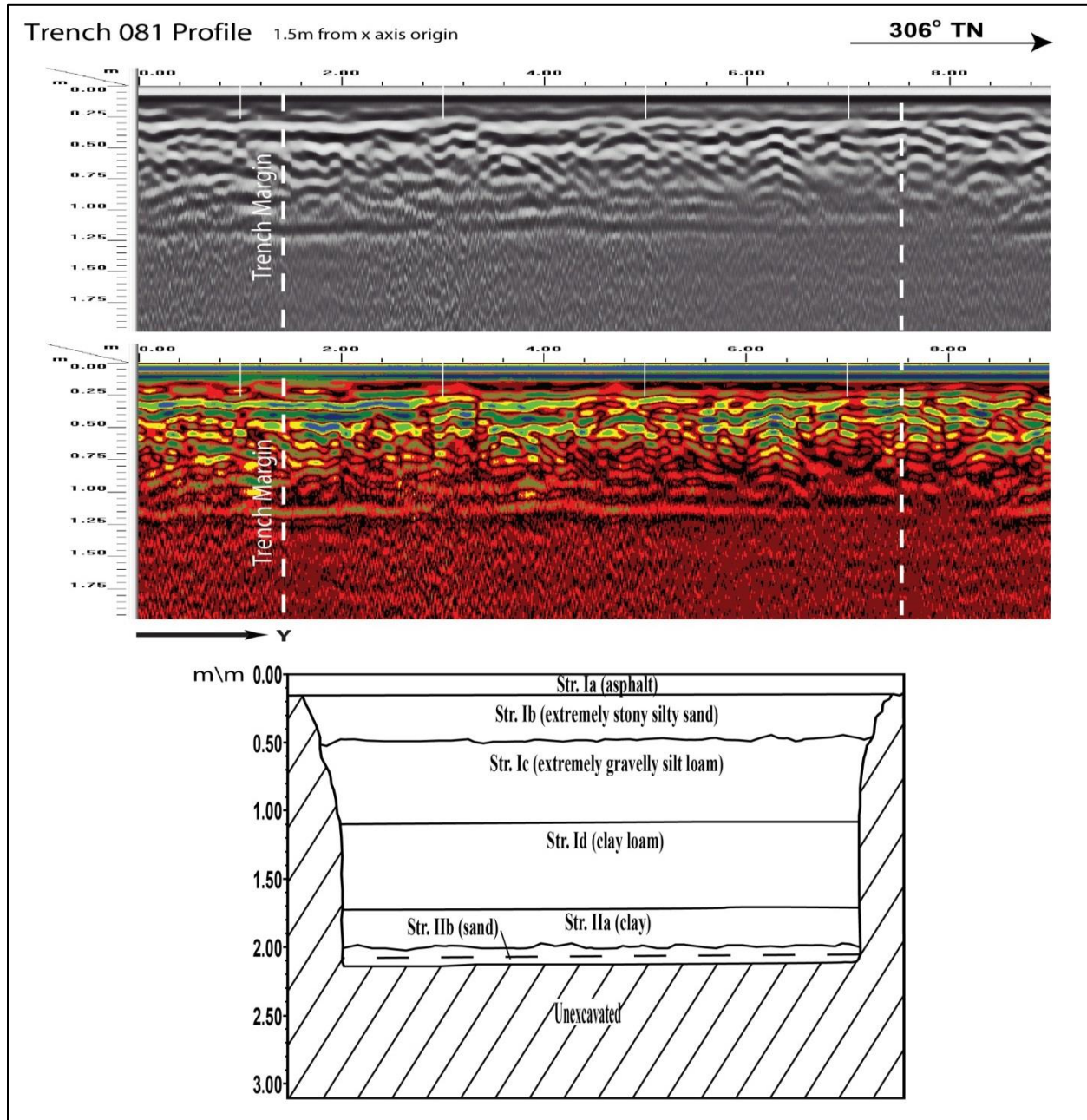


Figure 189. Visual comparison of excavated profile and GPR signal profile of T-081

Test Excavation 82

T-082 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the eastbound lane, 93.0 m northwest of Dillingham Boulevard and Akepo Lane intersection. The GPR grid measured 2.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transect. Utilities located near the excavation include: sewer line 2.3 m northeast and an electrical line 3.3 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 190).

GPR depth profiles for T-082 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 191). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. An anomaly was observed in the profile but it was not encountered during excavation. The maximum depth of clean signal return was approximately 0.9 mbs.

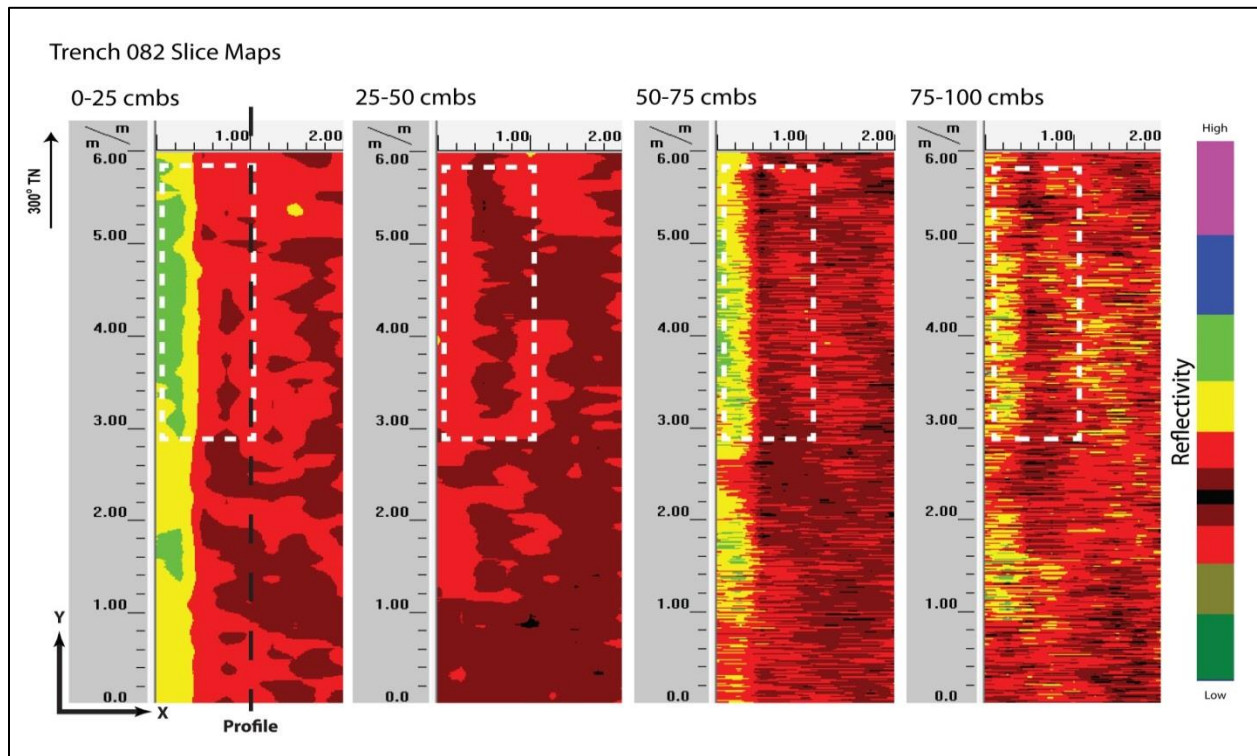


Figure 190. Slice maps of T-082 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 191). Strata Ia to Ie were clearly observed and occurred near the ground-truthed depths. Strata include a layer of asphalt on top of a very thin layer of extremely gravelly sand fill which was followed by extremely gravelly sand, then cobbly sandy loam fill and then silty sand fill. All other sediment transitions were below the maximum depth of clean signal return. No discrete objects were observed in the GPR results or subsequent excavation.

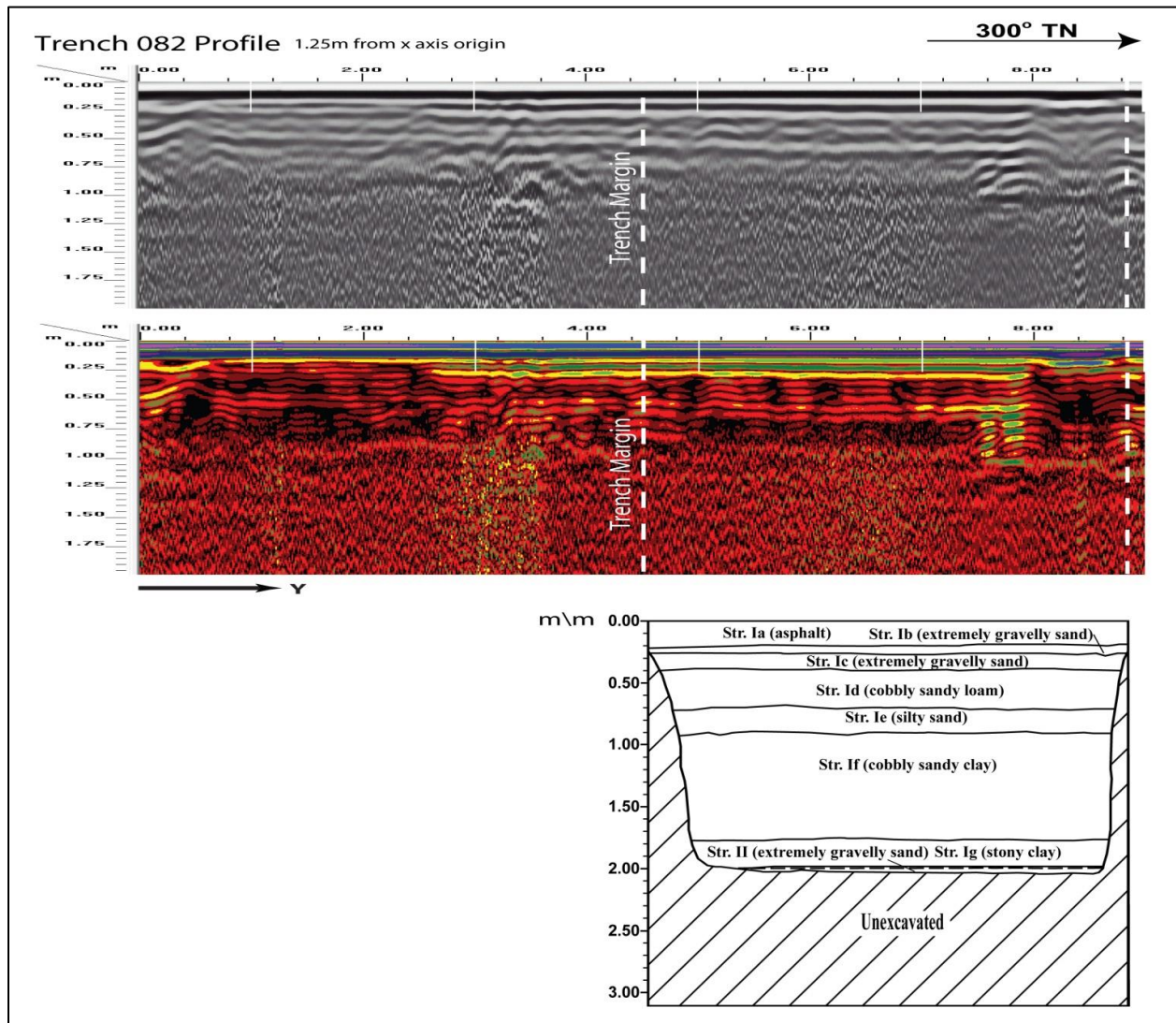


Figure 191. Visual comparison of excavated profile and GPR signal profile of T-082

Test Excavation 83

T-083 measured 0.9 m by 3.0 m and was oriented northwest to southeast and within a landscaped median between Dillingham Boulevard and the sidewalk on the northern side, 54.0 m northwest of Dillingham Boulevard and Akepo Lane intersection. The GPR grid measured 2.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 1.0 m east, 1.5 m northeast, and 3.0 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 192).

GPR depth profiles for T-083 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 193). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. Several anomalies were observed in the profile and seem to correspond to several roots that were encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

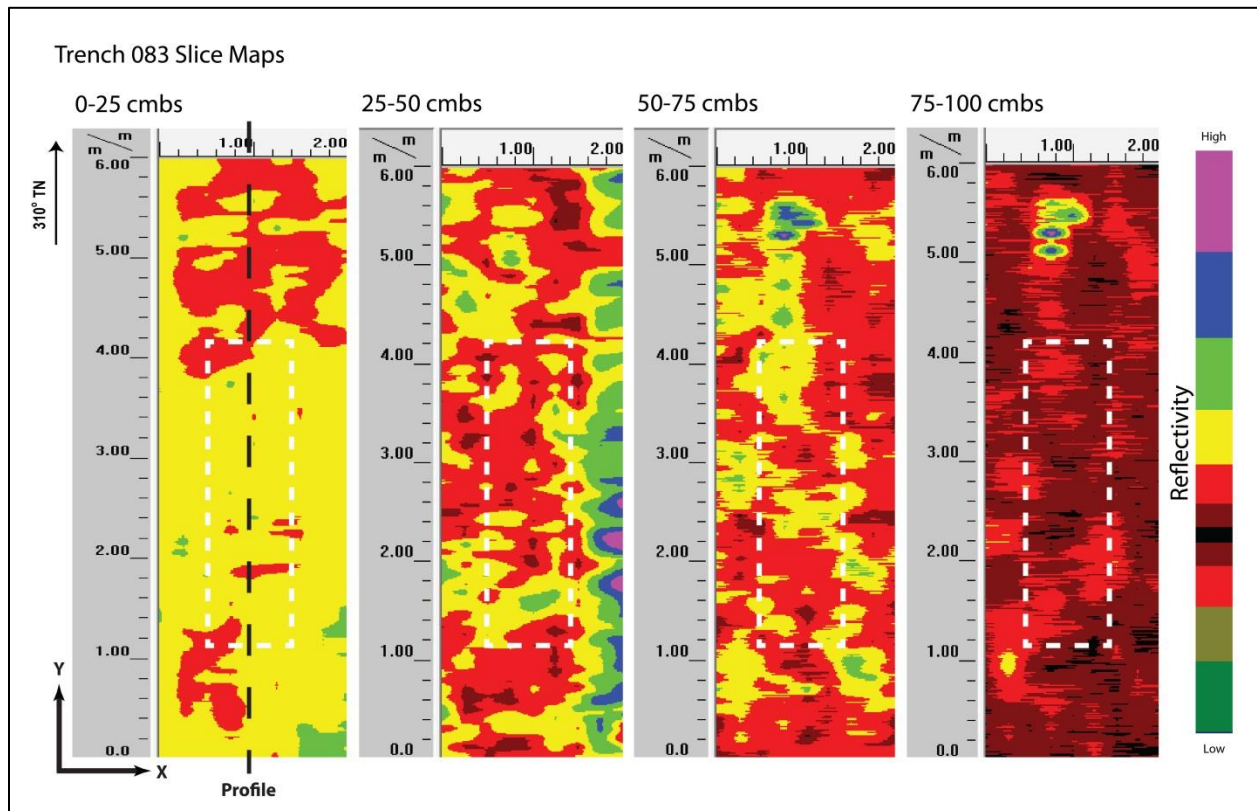


Figure 192. Slice maps of T-083 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 193). Strata Ia and Ib were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ib which was very gravelly sand fill. Several roots were encountered during excavation and seem to correspond to voided areas within the profile. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

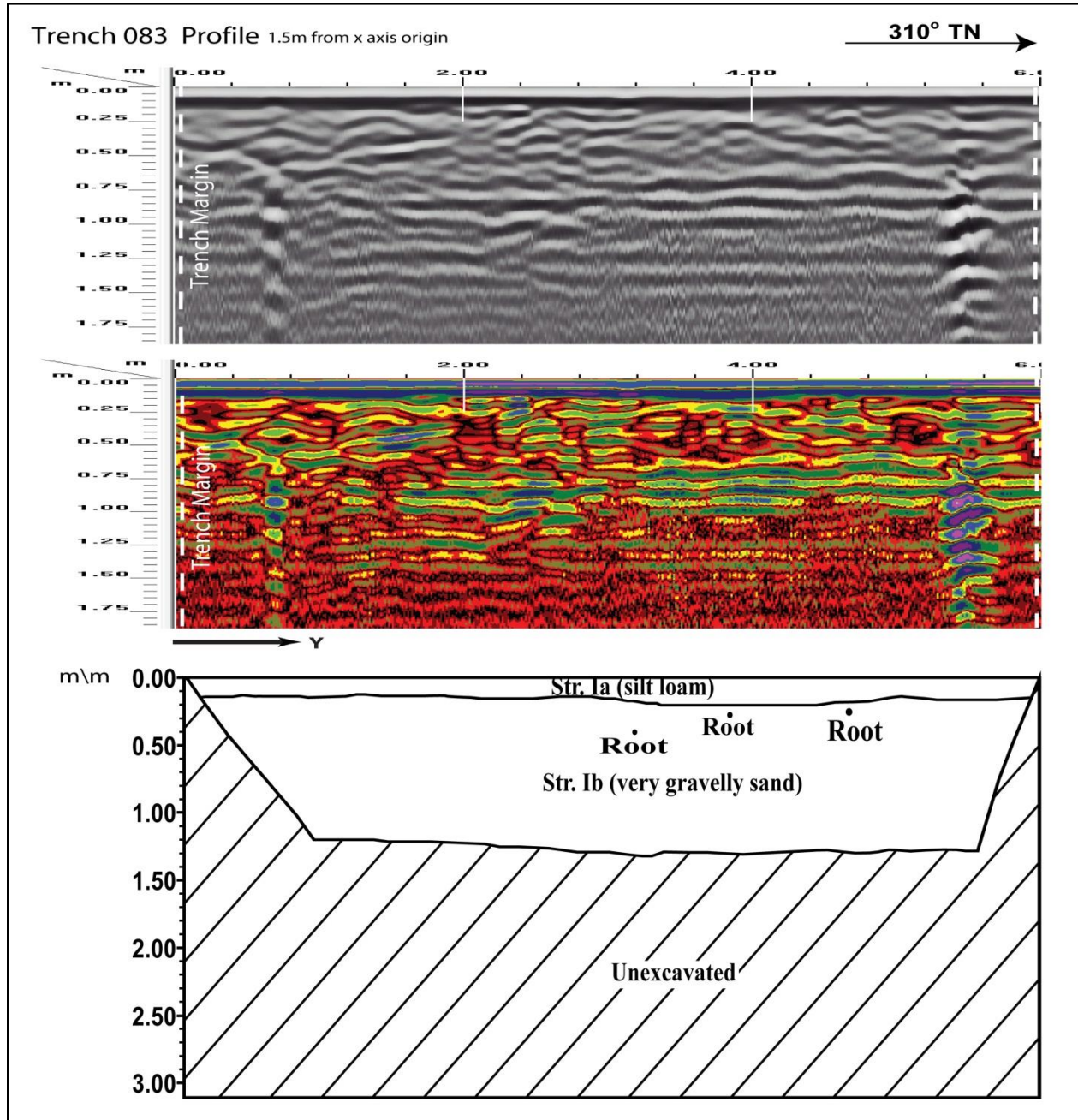


Figure 193. Visual comparison of excavated profile and GPR signal profile of T-083

Test Excavation 84

T-084 measured 0.75 m by 3.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the east bound lane 15.0 m southwest of Dillingham Boulevard and Akepo Lane intersection. The GPR grid measured 3.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 3.2 m northeast, electrical line 4.5 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but was not within excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the linear feature. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 194).

GPR depth profiles for T-084 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 195). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.3 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

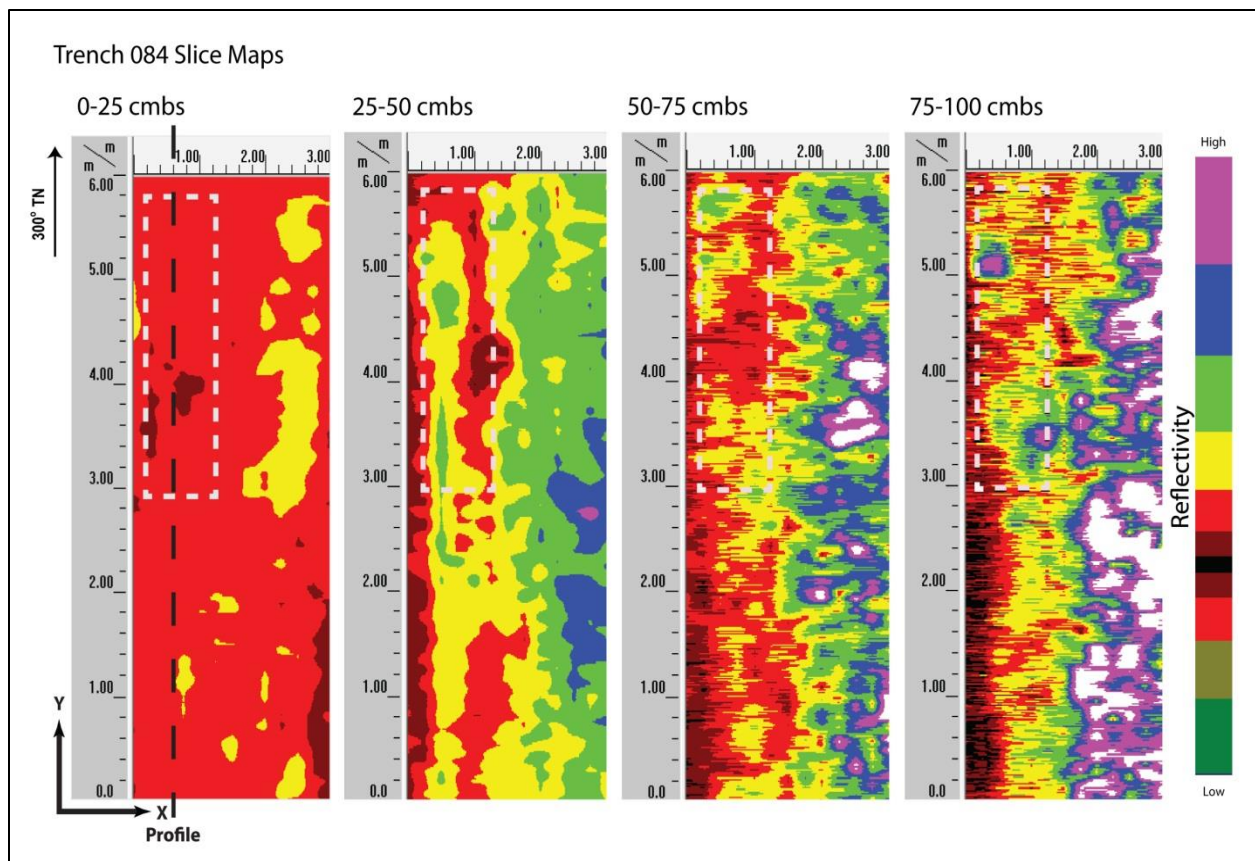


Figure 194. Slice maps of T-084 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 195). Strata included a layer of asphalt on top of very gravelly sand fill followed by the coral shelf. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

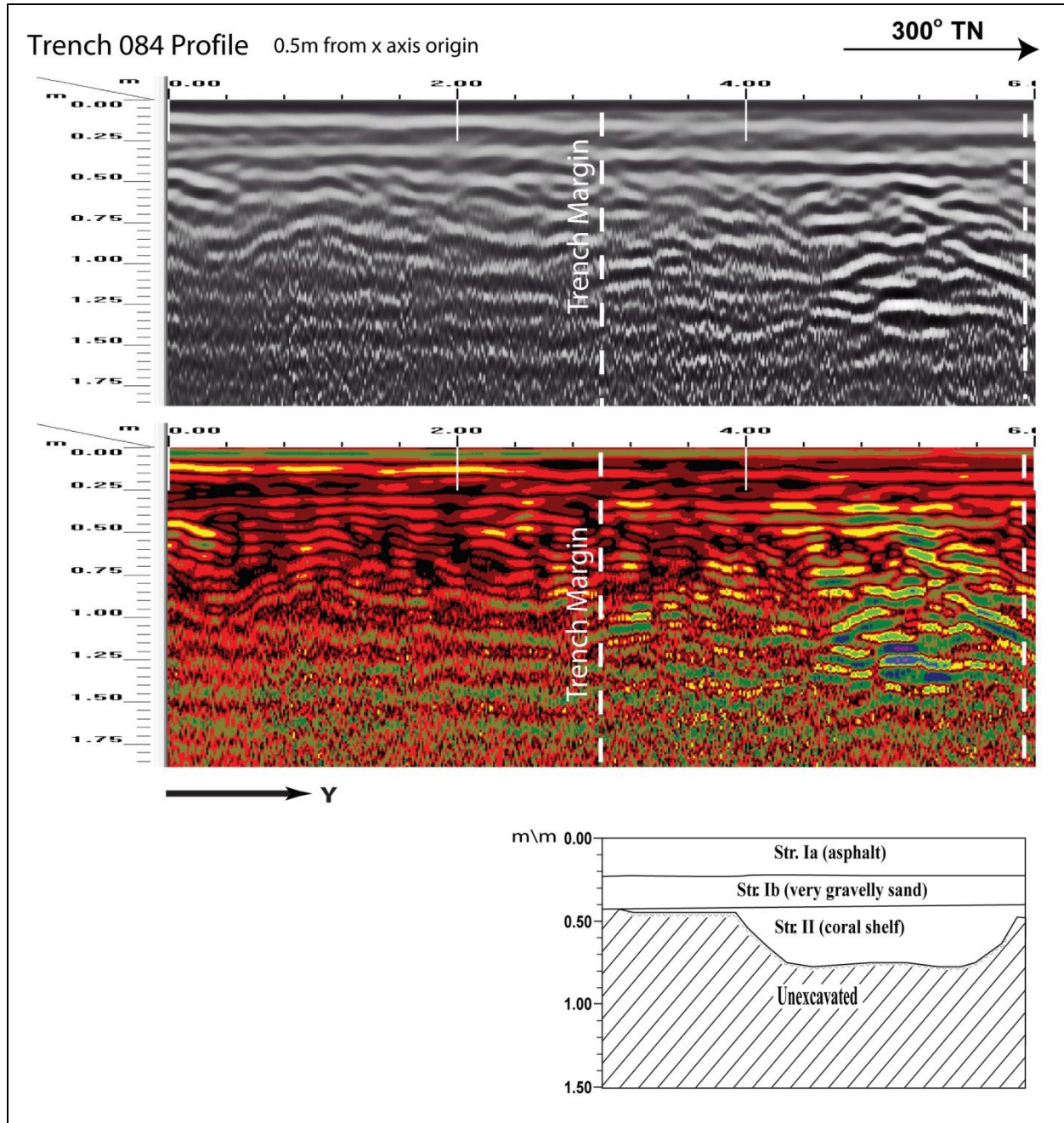


Figure 195. Visual comparison of excavated profile and GPR signal profile of T-084